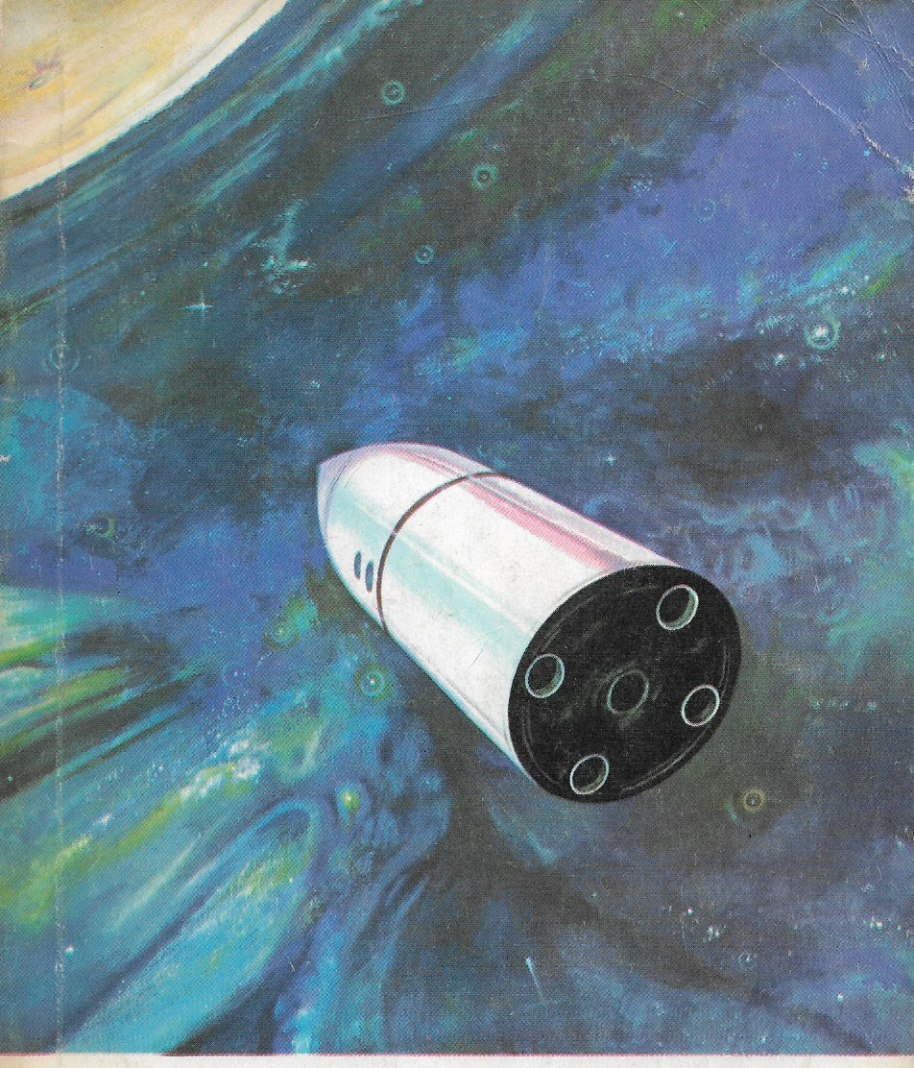

From Earth to Moon

JULES VERNE

NEW METHOD SUPPLEMENTARY READER STAGE 3

FROM EARTH TO MOON

FROM EARTH TO MOON

by

JULES VERNE

Adapted and simplified within the vocabulary of New Method Reader 3 by

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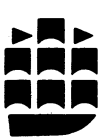

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All words outside the vocabulary of New Method Reader 3 are explained where they are used in the text, except certain words (such as Radio, Telegram, Telephone) which are known to all foreign readers.

One

THE GUN CLUB

A. The Gun Hall is a large building in the city of Baltimore in America. It is used only by those persons who have made guns, or by scientists who have planned guns. These gun-makers and gun-scientists joined together to form the Gun Club.[1] This Club held its meetings in the Gun Hall, Number 263, 99th Street, Baltimore, in the United States of America.

On a certain evening three members[2] were sitting in the Gun Club. The war had ended some time before. No more guns were being made; no plans were being drawn for new and better guns.

B. The three men sat there—in silence. At last one of them spoke: "This is a sad life;" said Tom Hunter, "there is nothing to do. No guns are needed. Perhaps no guns will ever be needed again. Our life's work is ended."

Bilsby pointed with his one arm to the many drawings of guns hanging like pictures on the walls of the room (his other arm was blown off by a gun which exploded). "Things of the past!" he said with a sad laugh. "There was a time when public

[1] A **club** = a number of people joined together for some form of play or work or study; also the house in which they work.

[2] **Members** of a club = persons in a club, persons who make up a club.

men were waiting at our doors; great soldiers were kneeling on their knees to us, saying 'Guns! Guns! Give us more and more and better and better guns.' But now the public men are in business: all they want is more and more and better and better motor-cars. And the soldiers are looking for any work they can find."

C. "This morning," said J. T. Maston, "I thought out a wonderful new gun. There has never been such a gun! But what is the use of it? No use! No one wants it." J. T. Maston was the most famous of all the gun-scientists; his name was known all over the world. He was a very big man, six feet tall and very broad. Beside him the two others looked like boys. He closed his eyes and sat

back in his chair. "Nobody wants my new gun," he said again.

"I am thinking of becoming a farmer," said Tom Hunter. "As I sit milking the cows I shall dream about my guns."

"I can't farm with one arm, and I know nothing about business," said Bilsby. "I am thinking of becoming a school teacher; I shall talk to the boys about guns, and at the same time teach them $(x + y)^2 = x^2 + 2xy + y^2$; boys will always love guns, and they will learn their x, y, z in hearing about them."

"But I," said the famous J. T. Maston, "I shall go on planning new guns, even if no one will ever make them, because I don't like cows, and I don't like teaching; and I know nothing about anything else—except guns."

D. There was silence. The three men sat looking sadly into the fire. . . .

The door opened. A servant came into the room. In his hand he held three letters. He gave one letter to Tom Hunter, another to Bilsby, and the third to J. T. Maston.

The three men opened their letters. The three letters were all the same:

There will be a meeting of the Gun Club on the 1st of October. At this meeting I shall have something very important to say. I hope that all members will be present. *Impey Barbicane.*
September 17th. *President*

Two

PRESIDENT BARBICANE'S PLAN

A. It was the evening of October 1st. A great crowd pressed along 99th Street, Baltimore, towards the Gun Club. It was not possible for all of the members to get inside the great hall of the club; many stood at the doors or looked in through the windows.

The hall was a wonderful sight. The walls were covered with guns of every shape and size. The lamps were fixed to stars made of crossed guns. The seats were made of gun-carriages, and President Barbicane's seat at the end of the hall was a ship's gun-carriage used at the Battle of Trafalgar. The legs of the President's table were made of guns, and the top of the table was made from a piece of steel cut from the side of a famous war-ship. On the right-hand side of President Barbicane's table there was a very large black-board used by scientists when speaking to the Club.

B. At one minute to eight President Barbicane came into the room. He was a tall, thin man, forty years of age. He had cold blue eyes. He spoke little and never a word more than was needed.

Barbicane was a very good man: he made his money in business, but during the war he held a very high office in the government, dealing with all the new

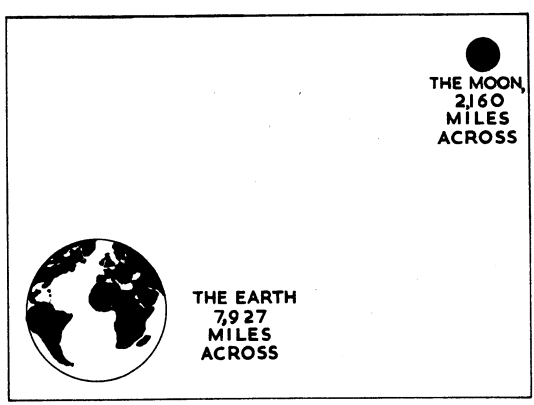
guns needed for the army. He was different in one way from all the other members of the Gun Club; he was whole and complete; he had both his arms, both legs and all his fingers; no part of him had been blown off by an explosion at any time.

At exactly eight o'clock President Barbicane stood up. He struck the steel table in front of him with an iron bar. There was silence. He spoke:

"Since peace came, our labours have ended. As there is now no war to work for, we must find some other line of work. Science cannot stand still. For some time past I have been studying a plan which might, I believe, be worth your attention. I will tell you what it is. . . ."

C. President Barbicane began to tell his plan: "You have all seen the moon. It is, as you know, a ball in the sky, 2160 miles across."

He drew on the black-board:

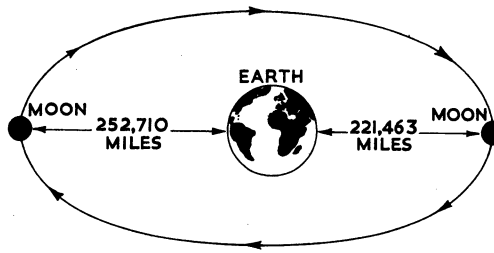


"A good soldier can hit a circle two inches across at a distance of one hundred or even three hundred yards. One of our ship's guns can hit a circle two feet across at a distance of a mile. But here we have a mark which is over two thousand miles across! Surely the Gun Club can hit that!

There were questioning sounds among his listeners.

"Ah!" he continued, "—the distance! Of course the moon is distant. At its most distant point it is 253,000 miles away—to be exact, 252,710 miles. But it does not go round the Earth in a perfect circle with the Earth as its centre."

D. Barbicane turned again to the black-board:



"When the moon is at its nearest point it is only 221,463 miles distant."

"But that," said one of the hearers, "that is a very long way!"

"It would certainly be a very long way if our shot had to travel all the way through air. But as our shot goes upwards from the Earth, the air becomes less and less, and two hundred miles above the Earth there is almost no air at all. Our shot will be travelling freely through nothing."

"It is still a very long way!" said the member.

"Not so very long," answered President Barbicane, "because when our shot has travelled $\frac{5}{6}$ of the distance it will be drawn downwards by the moon. It will begin to fall on to the moon: the last 37,000 miles need no power at all; it will only be falling down."

The listeners were quiet. There was such a silence that you could have heard a pin drop.

Then Captain Nicholl stood up.

Three

CAPTAIN NICHOLL SEES DIFFICULTIES

A. Captain Nicholl stood up at the back of the hall. He was a small, red-faced man. He made steel during the war, and was the great enemy of Barbicane. When Barbicane made a new gun which would send a shot through any known steel, Nicholl made a new steel which would stand against shots from the new gun. Just as the war ended Barbicane had made a new gun, and Nicholl had not time to try to make a new sort of steel before the war ended. So Barbicane's gun went unanswered: Nicholl had never forgiven this!

"This all sounds very simple and easy," said Captain Nicholl, "but it is not so easy when one begins to look into it. In order to get free from the downward pull of the Earth a shot must be travelling very fast. It must be travelling seven miles a second. Is there any explosive which is able to drive a shot so fast as that?"

"There is such an explosive," answered Barbicane in a quiet voice. "Its name is Atomite."

B. But Captain Nicholl did not sit down.

"Ha! you say that there is the explosive: but is there the gun? Can there be the gun? I say that there is no form of steel from which such a gun could be made. No known steel would be strong enough

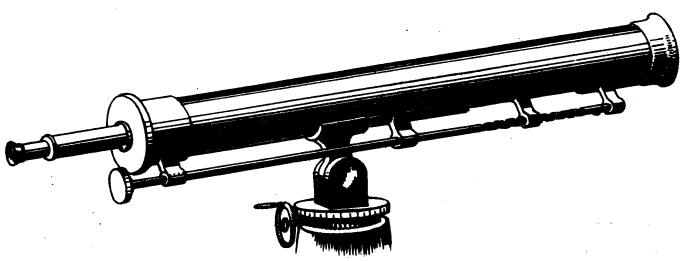
to contain the force of such an explosion. I need not tell Barbicane that I know quite a lot about steel in all its forms. What is his answer to that?"

"The gun will not be made of steel," answered Barbicane. "There are metals far stronger than steel. These metals were coming into use at the end of the war. The shot which broke through your strongest steel, Captain Nicholl, was made of such a metal."

Nicholl's face became even redder than before.

An old gentleman with white hair stood up in another part of the hall. He spoke in such a quiet voice that others could hear him only with some difficulty. He was a famous scientist who not only studied guns but also was very learned about the stars. His name was Doctor Belfast.

"How will you know," he asked, "if your shot reaches the moon? The smallest thing which can be seen at that distance, even by the newest and largest *telescope* would be about ten feet across."



"*Nine* feet," said Barbicane. "That is the measurement which I had planned. Our shot will be over nine feet across."

C. "Thank you," said the old man. "If such a shot

were fired, it might be possible to see whether it hit the moon—or some very bright light might be used as a sign that it had arrived. I am not able to say whether a gun could be made large enough and strong enough to fire such a shot. It is some years since . . ." The rest of his words could not be heard. Nicholl was again on his feet and speaking before the other had finished.

"Will President Barbicane tell us how long the gun will be which is to fire a shot of that size? The length of a gun is usually twenty-five times the *diameter* (the cross-measure) of the shot. So your gun will, I suppose, be about 225 feet long."

Richard Bilsby jumped up. It was Bilsby who had been thinking of becoming a school teacher, but now his eyes were bright with a new hope.

"Two hundred and twenty-five feet!" he cried; "that is laughable. This is a wonderful plan—wonderful! But it must all be thought out and worked out very carefully."

"Is 225 feet too long?" said Nicholl.

"It is not nearly long enough!" said Bilsby. "Our friend Barbicane says that he has an explosive able to drive a shot this very great distance. It must be an explosive which gives out a very great amount of gas. The small amount of gas which comes from our known explosives soon stops forcing the shot forward through the gun; so it is useless to make a very long gun. But a great amount of gas from a very powerful explosive will need a longer time to act upon the shot; it will need a far longer gun than any gun which has yet been made."

Nicholl was still standing up: there was a strange look in his eye as he asked his next question.

"Exactly how long a gun does Mr. Barbicane mean to have?"

"Nine hundred feet long," answered Barbicane quietly.

D. "Ha!" cried Nicholl. "Nine hundred feet long. And how does our friend hope to move such a gun from side to side and up and down so as to point at the moon as it travels across the sky?"

The old scientist spoke from the back of the hall without standing up. "You would not point it at the moon."

All this time President Barbicane had been listening without trying to say a word; he was pleased that his hearers should talk about his plan. He thought: "The more they talk the more they will want to act when the time comes—if only to prove that I am wrong. So let them talk."

Tom Hunter was standing up now. (It was Tom Hunter who had thought of becoming a farmer.) When Hunter was not at work he liked to go out shooting and bring back some birds for his evening meal.

"You don't shoot at a flying bird," said Tom Hunter. "You shoot where you expect the bird to be when your shot arrives. So I suppose that President Barbicane will point his gun at the place in the sky where the moon will be when the shot gets there."

"Just so," said Barbicane; "exactly so!"

Dr. Belfast's quiet voice was heard in the short silence which followed these words: "It would be pointed at that place in the sky where the moon is 221,463 miles distant, its smallest distance from the Earth."

"Just so," said Barbicane; "exactly so!"

E. "And how long will the shot take to get there?"

"I have asked my friends at Chicago University to find out the exact answer to that question," said Barbicane. "Of course if the shot travelled equally fast all the way—as fast as when it first left the gun, the answer would be easy; the time would be about nine hours. But it is not so easy as that; the shot will be travelling more and more slowly until it comes near to the moon, and then faster and faster as it falls on to the moon. I believe that the time would be about ninety-seven and a quarter hours. But I may be wrong."

Dr. Belfast pulled out a piece of paper and began writing hurriedly on it so as to see if Barbicane was right or wrong.

"So," said Tom Hunter, "you'll fire at your bird when it is ninety-seven and a quarter hours' journey away from the place where you mean to hit it?"

"Just so," said Barbicane, "but not exactly so; about ninety-seven and a quarter hours. I am not sure of the exact time." He looked towards Dr. Belfast, still writing hurriedly on his bit of paper.

There was a short silence in the hall. Then there was a loud *buzz buzz* as of thousands of bees, as the members began talking to each other, some

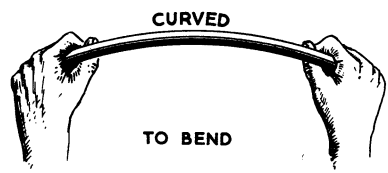
questioning, some answering; some saying that it might be possible, and some saying that the whole plan was a foolish dream and that Barbicane was out of his mind.

Then Nicholl stood up again.

"Silence!" cried Barbicane.

"Ssh! Ssh!" said everyone.

F. "Let us suppose," said Nicholl, "that your gun, nine hundred feet long, does not have to be moved. Let us suppose that it is fixed, pointing up into the sky at the place where the moon will be in ninety-seven and a quarter hours' time, has Mr. Barbicane thought about what happens to a long straight bar held up only at one end and at the middle. Will it remain straight? It will not! Make that bar as strong as you please, it cannot remain straight. The force of the Earth will pull the further end downwards—perhaps an inch, perhaps a foot. It will *bend* the gun into a *curve*. If you make the gun stronger you make it heavier, and the heavier you make it, the more it is bent. Perhaps your learnéd men at Chicago are also working out an answer to the question, 'How can Mr. Barbicane hit the moon by firing at it with a *curved* gun?'"



Dr. Belfast took out another piece of paper and began drawing and writing on it.

There was loud laughter from some of the gentle-

men present, but angry cries from others. President Barbicane struck the table again and again with his iron bar, but no one took any notice. At last when the noise stopped and there was silence again, the voice of Dr. Belfast could be heard:

"If the gun was bent one inch out of the straight, in a distance of 221,463 miles this would make the shot fall many miles wide of its mark. If you will wait I will tell you just how many miles."

"I am sure Dr. Belfast is right," said Captain Nicholl. "So with his curved gun President Barbicane means to spend thousands and thousands of dollars in sending a shot many miles wide of the moon!"

G. "Why," said Barbicane, "why does Mr. Nicholl suppose that the gun will be held up only at one end and at the middle like an army gun or the gun on a ship?"

"Will you build a wall all the way along it?" said Nicholl. "Let me think: your gun will not point straight up, but . . . well, say a wall eight hundred feet high?"

"No," said Barbicane. "Not a wall. But I thank you for the kind help which you are trying to give me in carrying out this plan. I shall make a hole in the ground. I shall make the gun in that hole. The earth itself will give strength to the gun all along its length and will keep it perfectly straight, and it will fire straight up into the sky."

There was a *buzz* of surprise at this wonderful plan. It stopped as the famous J. T. Maston stood

up. He walked slowly to the front of the hall, then turned facing the people present:

"Gentlemen," he said, "we are all glad that the war has ended, but we are all sad at the thought of the ending of our studies in this great science. Mr. Barbicane has given us a great question, something that will send us back to our books and papers with a new hope. But no man likes to work only on paper; only children can make themselves happy with dreams of what might be. But I know my friend Barbicane too well to believe that he would put before us any plan which is impossible. I myself believe that this plan is possible. I believe that it is, indeed, not even very difficult. It will need money: those who made great amounts of money making guns in the war may now give their gold to make a gun which can hurt no one; for there is no one living in the moon."

"I would not be sure of that," said Dr. Belfast; "nothing is impossible."

"If our shot reaches the moon we may learn far more about our little sister-world than was ever known before. . . . Is it decided that we carry on the work?"

There were shouts of "Yes! Yes! the Plan! the Plan!"

One voice cried "No!": it was Captain Nicholl's.

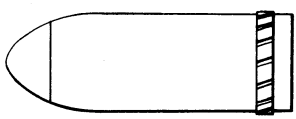
And one voice remained silent—the voice of Dr. Belfast. "I don't understand," he said as he left the hall, "I don't understand how we can learn anything about the moon if no one goes there inside the gun-shot. And I'm certainly not going myself!"

Four

THE SHELL

A. The Gun Club asked four men to work out the plan and decide exactly how it should be carried out. These men were (1) President Barbicane, of course, and (2) J. T. Maston. To these were added two soldiers, (3) General Morgan, and (4) Major Elphinstone, who would be able to deal with the money and business matters.

At first it was thought that the shot would be just a mass of metal of the right size and shape, but it was found that this would be far too heavy.



SHELL

"A round shot nine feet across would weigh 200,000 pounds. But the shot from our gun should not, I think, weigh more than 20,000 pounds."

"If the shot weighs only 20,000 pounds and is made of steel there must be a hole in the centre of it," said General Morgan. "It must be a *shell*."

"Of course," said Barbicane.

B. J. T. Maston was writing on the paper in front of him on the table. After a short silence he said, "Then the sides of the shot will be only two inches thick."

"That's not enough," said General Morgan; "it would not be strong enough."

"Then what is to be done?" asked Major Elphinstone.

"It must be made of some lighter metal than steel," answered Barbicane. "You all know the white metal *aluminium* of which our cooking pots are made. Its weight is one-third ($\frac{1}{3}$) the weight of steel."

"But it is quite soft and very easily forced out of shape," said Major Elphinstone.

Maston laughed. "I know what my friend Barbicane is thinking about. He is thinking of R.R. Am I right, Barbicane?"

"Exactly so!" said Barbicane. "R.R. is the answer. It is aluminium mixed with six other metals. The amount of each of the other metals is very small, yet they have the power of adding very greatly to its strength. A piece of R.R. is three times as strong as a piece of steel of the same weight. I have found that a shot of the size and shape which we need, if made of R.R., would weigh 19,250 pounds.

C. "And the shell would cost . . .?" said Maston.

"We leave all questions of cost to our soldier friends. Rich men all over the world are promising money to help our plan. We must not think of cost."

"They won't be rich men after they have paid for this," said Elphinstone.

Indeed the story of the meeting of the Gun Club and of President Barbicane's plan had been reported

in all the *newspapers* of the world. Millions of words had been written about it: great scientists all over the world were talking about it, some saying that it was impossible, some saying that it was a brave and important trial of the powers of science. Everyone was talking about the Moon Gun, even those who knew nothing about science and nothing about the moon except as a bright circle in the sky.

Five

WHERE SHALL THE GUN BE PUT?

A. One great question remained to be decided: where was the great gun to be put?

On October 15th a general meeting was held at the Gun Club. At the end of the hall, behind President Barbicane's seat, a large map had been fixed to the wall.

President Barbicane struck the steel table with an iron rod. There was silence. He stood up.

"Gentlemen, since our last meeting we have looked into all the scientific matters necessary for the building of the great gun, and we have decided the size of the shot, and the metal of which it is to be made. But there is one question which we did not feel able to decide—where the gun is to be built. That question must be decided by all the members of this club. The question before us this evening is therefore, 'Where is the great gun to be put?'"

The members sat up and looked towards Barbicane who was unrolling a large map of the world.

"I have asked the learned gentlemen at the University of Chicago, and I am told that the gun should be pointed straight upwards at the moon. Now the moon does not pass right overhead in the furthest north or furthest south. I have marked on the map the parts of the world in which the gun can be put. You will see from the map that the only

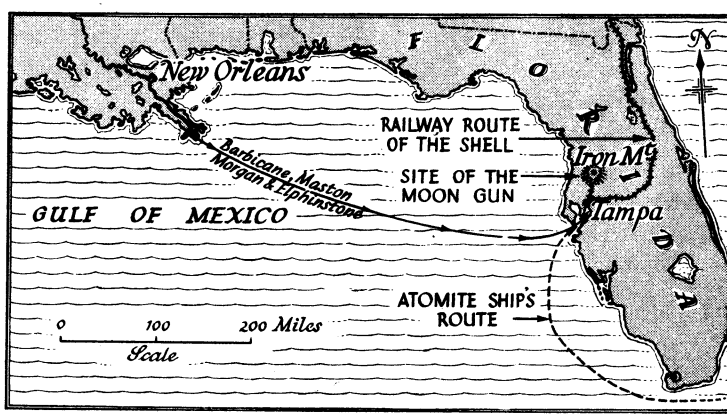
possible places for the gun are the southern part of the United States, the northern part of South America, or North Africa or part of India or China. May we decide that the gun is to be in the United States of America?"

There were loud cries of "Yes! Yes!" from all except Captain Nicholl who sat silent.

B. "In the United States," said Barbicane, "it must be either in Texas or in Florida. Now there are many fine cities in Texas . . ."

Captain Nicholl stood up: "As your gun is almost sure to explode, killing all people who are within several miles of it, it should be put as far away from all cities as possible."

"For once," said Barbicane, "I agree with Captain Nicholl, but not for the same reason. My reason is that the firing of the gun will certainly shake the ground and cause great movement of the



air, and the great masses of burning gas which will follow the shot may do hurt to plants and to animal life. So it should not be near a town."

Major Elphinstone spoke next. "I am taking care of all money matters and I am pleased to report that money is coming in very fast. But I do not think we ought to waste money. Everything needed for the gun will have to be carried to the place. It costs far less to carry goods by sea: so they will go by ship. You can see from the map that the journey to Florida will be far shorter than the journey to any part of Texas.

C. Dr. Belfast walked slowly to the front of the hall: at the last great meeting many gentlemen had said that they could not hear him, so Barbicane had asked him to speak facing his hearers.

"You must think," he said, "not only of what is on the land, but of what is under it. Mr. Barbicane means to make a hole nine hundred feet deep. Into what will he make it? If he makes it into soft earth, it will not help his gun. And, in low-lying land, the hole will fill with water. If he tries to make it into hard rock, he will not get very far. I have looked at the map showing the rocks which lie under the land in Florida and Texas, and I find that perhaps a place named Iron Mountain near Tampa in Florida would be as good as anywhere."

"Yes," said Major Elphinstone. "Tampa is a good place for the ships. But I would like to know what Mr. Maston and General Morgan think about it."

"We need open country," said General Morgan: "we must put up huts for our workers. We must be near enough to a town to get food and other needs—but not too near because of the danger to life."

Major Elphinstone came forward. "I have visited Tampa and I know Iron Mountain," he said. "The mountain is some distance to the north of the town; it is 350 feet high, and is in the middle of open country. I think it would do very well, if . . ."

Captain Nicholl broke in on the speaker. "It will do very well if our friend Barbicane is ready to make a hole nine hundred feet deep into a mass of iron."

D. Dr. Belfast was laughing.

"I see," said Captain Nicholl, "that the learnéd Dr. Belfast is laughing. He has good reason to laugh at so foolish a plan."

"I was laughing at you sir," said Dr. Belfast, "there is certainly an Iron Mountain which is made of iron; or, I should say, there is a lot of iron in it; the Ford Motor-car Company get iron from it. But that Iron Mountain is in the northern part of the United States. The Iron Mountain in Florida has no iron in it. It is made of the same thing as that which you see in the hand of President Barbicane for writing on the black-board; it is made of *lime-stone*, and lime-stone is much the same as *chalk*!"

There was loud laughter from all the members. Captain Nicholl's face became blue with anger. He sat down.

"Is it decided, then, that the gun shall be on Iron Mountain near Tampa, Florida?" said Mr. Barbicane.

"Yes," cried all those present—except Captain Nicholl, who said that the middle of the Atlantic Ocean would be safer.

"There is another matter," said Mr. Barbicane. "I understand from our friends at Chicago University that their largest telescope would with difficulty follow our shot on its way to the moon but they can have a larger one ready by the time our gun has been made. Kind friends of the University have offered to pay the cost of this. May I write to them thanking them for their offer?"

There were loud cries of "Yes! Yes!" in which even Captain Nicholl joined.

"We have now only to get on with the work," said Barbicane, and the meeting came to an end.

Six

MAKING THE GREAT GUN

A. The four gentlemen (Barbicane, Maston, Morgan and Elphinstone) arrived at New Orleans on October 25th, and went on to another ship which took them to Tampa. It was a rather big town—100,000 people: the country around is very beautiful and much fruit is grown there.

The four men took a car to Iron Mountain. The car climbed up and up until at last it stopped. "This is the place," said the driver. "This is the top of the mountain."

The four men got out of the car. They looked down over the wide green country; then they looked up at the sky.

"This is the place," said Maston.

A second car arrived a few minutes later. Two men got out of the car. One of them, Harrison, carried a large map of the country. The other was Murchison, the man who was to carry out the work.

B. With the help of the map an exact plan was made showing just where everything would be—the gun, the workers' huts and, most important of all, the *furnaces* (great fires) in which the metal would be heated so that it would flow down into the hole in which the gun would be.

"The furnaces," said Murchison, "must be built

in a circle round the hole, and when the order is given, the metal must flow out of all of them at once into the hole. The workers' huts will be in a circle outside the furnaces. A storehouse must be built here near the road, and new roads must be made from it to the furnaces, and to the huts."

Next day Murchison went to the city of New Orleans to get supplies which could not be had in Tampa.

After a few days workmen began to arrive. Huts seemed to come up in the night. More and more workers came and moved into the huts. A railway was built from the sea at Tampa to Iron Mountain.

C. The real work of making the hole was to begin on November 10th. On that day Barbicane called all his workers together:

"Our work," he said, "is to make a hole nine hundred feet deep. Inside this hole there will be a circle of stones, fixed together with steel bands; inside this stone wall there will be a wall of stuff which will keep the heat of the metal from the stone. Liquid metal will be poured into the hole to make a gun from which a shot will be fired to the moon. We have about two hundred days in which to do this work. It can be done if all work hard and there is no waste of time."

At eight o'clock on the next morning, work began. From that time work went on by day and night. The workers were changed every four hours.

At the end of the first month the hole was 112 feet deep.

D. In December and January the work went on faster, but in February there was trouble with water coming into the hole from the side; stone fell into the hole and some workmen were killed.

On the 10th of May the hole was nine hundred feet deep and the inside of it had been covered with a very thick circular wall of hard stone. This was then covered with the stuff guarding it against the heat.

President Barbicane then told the men what was to be done next. "In the centre of the hole we must build a circular piece. The hot liquid metal will be poured into the hole round this centre piece. When the metal is hard the centre piece will be taken out, so leaving the hole up which the shot will be fired."

The work began.

While all this work of making the hole was being done, other work was going on all round.

One hundred furnaces were built in a circle round the hole. From each furnace there was a way down which the liquid metal would flow into the hole.

The bars of metal were brought by ship to Tampa; from there they were carried by railway to Iron Mountain and put ready for the furnaces.

All was ready by the beginning of July. It was arranged that the pouring of the metal into the hole would be done on July 8th.

E. Mr. Maston, General Morgan, Major Elphinstone—and, of course, Murchison (the head man of

all the workers) and President Barbicane were there. If anything went wrong, there might be great danger, so soldiers were put all round the mountain so that no one might come near.

President Barbicane called together the head men of all the furnaces.

"By the morning of July 8th all the metal must be ready. At five minutes to twelve a bell will be sounded; at twelve o'clock a gun will be fired. Then the doors of all the furnaces will be opened and the metal will flow into the hole."

Each man went back to his furnace.

Barbicane and the three others stood on a small piece of higher ground just outside the circle of furnaces. A light wind was blowing from the south. Over there, to the south, the sky was blue with only a few white feathery clouds. Between the mountain and the town was a line of soldiers, and small companies of guards stood on all the roads leading north from the town. To the north, behind the four men, everything was hidden under a cloud of *smoke* pouring from the furnaces.

Barbicane looked at his watch; it showed seven minutes to twelve.

He waited. There was a deep silence. Then the silence was broken by the loud ringing of a bell.

Again silence. Four minutes—three minutes—two minutes—one minute . . . A gun was fired.

Before the last sounds of the gun-shot had died away bright streams of liquid metal began to move, like the bars round the centre of a wheel, towards the great hole. The air all round seemed to shake with the rising heat. Nearer and nearer the rivers of liquid metal moved towards the centre. Then at last they all fell down towards the centre of the earth. A great cloud of smoke rose high into the sky.

Seven

THE COOLING OF THE GUN

A. Had everything gone as they had planned? Was the great gun all right? No one could know: no one could be certain until many days had passed. Until then the metal would be far too hot for anyone to go near the place.

Fifteen days after the pouring of the metal clouds of smoke were still rising and the ground burned the shoes of anyone who came within two hundred feet of the top of Iron Mountain. All they could do was wait.

"August the 1st!" said J. T. Maston one morning; "it's only four months to December 1st—the day on which the moon will be just in the right place for the firing of the gun. We shall not be ready in time. How can we be ready in time?"

Every day they went to look at the place. On August 10th the smoke was less and coming only from the centre of the hole. On August 15th they were able to begin work again. The inner upright piece was slowly taken out: this was rather difficult because the heat had hardened it.

B. At last the gun was clear and J. T. Maston was able to look down it: he tried so hard to see down to the bottom that he nearly fell down it head first;

but the strong hand of Major Elphinstone saved him just in time.

A large basket was fixed to a rope passing over a wheel and the four men were let down the inside of the gun. It was very hot at the bottom. Looking upwards they could see only a small circle of sky—that circle of sky through which the moon would pass many hours after the shot had been fired.

Many of the Gun Club came from Boston to see the great gun, and some went down in the basket to the bottom.

On September 5th the people from Tampa were allowed to come and look at the gun, but soon people were arriving from all over North and South America. Some even came over from Europe. All day a stream of people flowed up the mountain; they looked down into the inside of the gun now lit up with electric lights, then went down the mountain on the other side.

Day after day the endless stream of people flowed on.

* * * *

Only two months remained before the great gun would be fired.

Eight

TELEGRAM

A. On September 11th President Barbicane received a *telegram.* He was sitting in his room in Tampa. Dr. Belfast had come to see the gun, and they were having dinner. The telegram came just as they were finishing their meal. Barbicane opened it carelessly thinking that it was only another of the thousands of good wishes which had reached him during the past few weeks.

Then he looked at it again. He laughed and was going to throw it into the fire. He stopped, and looked at it again.

"It's impossible!" he said. "The man is a fool! He is out of his mind!"

"What is it?" asked Dr. Belfast.

Barbicane read it out: "PARIS, FRANCE, SEPTEMBER 2ND. MAKE SHELL AS PLANNED BY ME AND I WILL GO IN IT TO THE MOON. ARRIVE TAMPA BY THE SHIP ATLANTA . . . MICHEL ARDAN."

"The man's a fool!" said Barbicane. "It's not possible. It would be certain death."

"I would not be sure of that," said Dr. Belfast; "nothing is impossible. Michel Ardan?—I seem to have heard that name before."

B. "Tell me then how it is possible!" said Barbicane.

"It would be possible to make a shell with an inner box inside it which would not be shaken by the explosion of the gun. I can think of at least two ways of doing it. It might be done by springs, or . . ."

Dr. Belfast had pulled out a piece of paper and was already covering it with numbers and drawings. President Barbicane had gone to the *telephone.*

"Is that the Florida Ship Company? . . . Do you know of a ship called *Atlanta*? . . . You do? . . . Well, when does it arrive here? . . . On September 14th."

Dr. Belfast looked up from his paper: "Has the making of the shell begun yet?" he asked.

"Not yet, but it will begin in the next two or three days."

"I think," said Dr. Belfast, "that you might tell them to wait."

Nine

MICHEL ARDAN ARRIVES

A. J. T. Maston and Barbicane stood waiting for the ship *Atlanta* to arrive. Already its smoke could be seen out at sea.

"Who is this man Ardan?" asked Maston. "Surely you did not stop the work on the shell because of a wild plan put forward by some fool who wants to see his name in the newspapers?"

"That was what I thought at first," said Barbicane, "but Belfast said, 'I seem to remember having heard the name before.'"

"And," said Maston, "I suppose Belfast added, 'nothing is impossible.'"

"Just so!" answered Barbicane. "So I wrote to some French friends in New York to ask if they knew of him. They answered 'Oh! yes; every Frenchman knows about Danger Ardan.'"

"And who is Danger Ardan? And why is he called that?"

"As you know, Maston, there are often times when scientists and doctors and army-men want to know whether something is as dangerous as they had thought it to be. Men believed that it was dangerous to go up above a certain height on a mountain, or to go in an under-water boat (a *submarine*) under the sea. They believed that a man would die if he went for ten days without food, or if he were frozen in a

mass of ice. They believed—but they did not know. And when they wanted to know the truth about these things they always said 'Send for Ardan.' Ardan is a man who loves to live dangerously, and he loves to do the impossible."

B. "You think," said Maston, "that Ardan is coming here without really knowing the danger of what he wants to do? . . . He is coming to certain death."

"No," answered Barbicane; "I think the French scientists have sent him here, in the hope that he may, possibly, live. They want to know if a man can be shot from a gun and live."

The ship was now at the side. The first men to go on to the ship were Barbicane and Maston. They found Ardan seated right up at the front.

Barbicane stood looking at him. Ardan was about thirty years old—small, but hard and strong, with thick red hair. His face was broad and his eyes were large; he looked rather like a cat. Barbicane moved forward: "Mr. Ardan?"

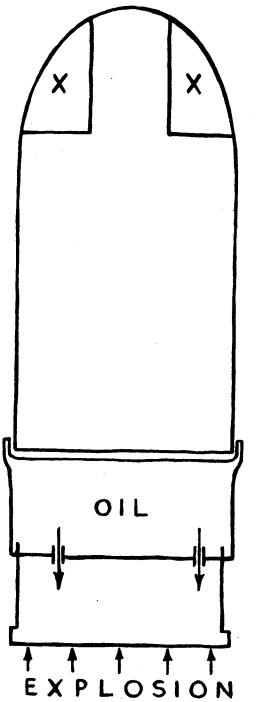
"President Barbicane! Let us go at once. I have the plans here. I have no boxes for which I must wait—only this bag in my hand. Come!"

C. Barbicane and Maston were hurried off the ship by Ardan who wanted only to tell them about the plan for the shell. Soon they were sitting round a table with Dr. Belfast, and Ardan's papers were spread out in front of them.

Dr. Belfast looked at the plans in silence. Now

and again he asked a short question; then turned back to the plans.

"I see," he said at last; "the shell is in two parts. This lower part is driven forward by the force of the explosion. But it does not strike the upper part because that force is used up slowly in driving a mass of oil through small holes into this container."



He took a pencil: "This," he said, "is the plan in a very simple form." He drew a plan.

"That is the plan," said Ardan. That lower part is not carried with the shell. It falls back from it. Some of the force of the explosion is lost in this way, but the shell is lighter than the shell planned by the Gun Club, so the length of the gun and the amount of the explosive will be enough."

"I suppose," said Dr. Belfast, "I must not ask who drew this plan?"

"You may ask," said Ardan, "but I must not answer.—Is it impossible?"

"I would not say that," said Dr. Belfast: "nothing is impossible. I think it might work. Let us try it, if you are willing to go into such danger."

D. Dr. Belfast still sat looking at the plan.

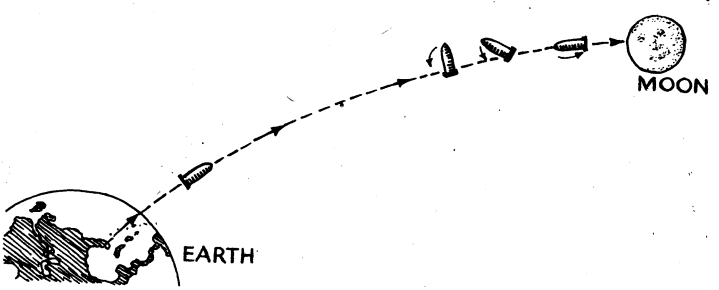
"There is one thing which I do not understand."

"Yes? Yes?" cried Ardan.

"I do not understand how you will come back."

"There are many things which I do not understand," said Maston. "You may not be killed by the explosion of the gun at this end, but surely you will be killed by hitting the moon at the other end of the journey?"

"No! No!" said Belfast; "that is arranged for. The bottom of the shot is heavier than the top; is it not? When the shot is inside the *attraction* (the pull) of the Earth the bottom, heavier, part is of course nearest to the Earth. But, when the moon is pulling the shot down towards itself, the heavier part will be towards the moon." He drew a picture:



"Oh! I see," said Maston, looking at the picture which Dr. Belfast had drawn. "But what slows the shot down so that it may fall down gently on to the moon and not be broken to pieces?"

"In the bottom of the shell a number of *rockets* are fixed. As you know, a rocket is a pipe full of explosive stuff which, as it burns, sends out hot gas with great force. The force of these burning gases

can be used to drive the rocket up into the air. Rockets are also used to drive aeroplanes through the air. The rockets are here used to slow down the fall of the shell; they will be fired when the shell comes near to the moon and will cause it to come down slowly and gently."

E. "I understand," said Barbicane. "That is a very good plan." He looked again at the plan of the shell.

"And what are these two squares inside the shell marked X.X.?"

"One of them," said Ardan "takes out from the air the used gases. The other adds to the air new *oxygen.* (Oxygen is the gas which the body needs in order to live; it is the gas which a fire needs to burn.) The body uses up the oxygen in the air; so the shot carries a supply of oxygen in steel containers. The gas can be let out of these containers as it is needed."

"I see a round mark on the outside of the shell. What is that?"

"There is a door in the inner box, and a pipe leading from it to the outer case. The end of this pipe is closed by a door which can be opened by moving a bar in the inner case. So it will be possible to see out through this double window. It will also be possible to put a thing into the pipe, shut the inner window, then open the outer window. In this way things can be put outside the shell. There are four such windows; one in each side, one in the top, and one in the bottom."

F. "It seems to me," said Dr. Belfast, "that these Frenchmen have thought of everything . . . everything except how to come back!"

"And I myself have thought of that," said Maston. "If our first shot hits the moon, we can fire a second shot, and in that shot put a rocket which will bring them back. The downward pull of the moon is very small; so it needs little force to carry a thing off the moon. Once it is away from the moon, the Earth will pull the rocket down to itself."

"That is a possible plan" said Dr. Belfast, "but the man will have to live on the moon until the second shot arrives."

"Oh!" said Ardan, "I can do that—there will be enough food in the shell. I shall wander about. . . ."

"So far as is known there is no air on the moon," said Belfast. "You must take with you a head-piece which will supply air when you go outside. But it is possible that you may find air in the lower parts of the moon. Nothing is impossible. Indeed I did not think it possible that Frenchmen knew so much science as is shown in this plan.

"Ah!" cried Ardan angrily; "some people are impossible!"

Ten

"I AM GOING TOO"

A. It was necessary for President Barbicane to tell the Gun Club what had been happening and to ask them to allow these changes to be made in their plan of the shell. Most of the members had already heard about Michel Ardan and the plans of the French scientists. So, on the evening of September 20th, 99th Street, Baltimore, was full of people hurrying towards the great hall. Soon all the seats were full and men were standing wherever there was room to stand. Half hidden in a dark corner of the hall stood Captain Nicholl: his face was even redder and angrier than before.

"I am wondering," said Tom Hunter to Bilsby standing near him, "I am wondering if there is any farming to be done on the moon. I fear not."

"Well," said Bilsby, "at least there are no schools there, and no boys whom I must teach x, y, z."

President Barbicane hit the iron table with his iron bar. Michel Ardan sat on his right and J. T. Maston on his left. Behind him were two large black-boards. The President stood up. He told the story of the making of the gun, of Ardan's telegram, of what he had learned about Michel Ardan, of the plan of the shell to be fired from the great gun. A large drawing of the shell had been made on the black-board. Barbicane told the use and meaning of each part.

B. Barbicane sat down. There was silence. Then a voice said from the dark corner of the hall, "And, if he gets there, how will he come back. How will we learn what he has seen?"

J. T. Maston stood up. He went to the second black-board on which there was a drawing of a rocket and told the gentlemen how it would be used.

President Barbicane stood up when Maston had ended.

"Shall we now draw back?" he asked. "Shall we say that we Americans dare not lose our money when this Frenchman dares to lose his life?"

"No! No! No! Go on!" shouted everyone in the great hall.

Then, as the noise grew less, a voice came from the dark corner:

"What about *your* life, President?"

There was a silence. Not a sound was heard.

Then the President's voice sounded, clear and quiet: "I am going too."

C. "You are going because you know that there is no real danger," said Captain Nicholl coming forward. "That great shell will never leave the gun; or, if it leaves the gun it will fall back to earth very soon after."

"Are you so sure of that?" said Michel Ardan.

"Of course I'm sure. Quite, quite sure. And so is Barbicane."

"Then, if you are sure that there is no danger, why don't you come with us?" said Ardan.

A storm of laughter broke out in the hall. Men shook with laughter so that they had to sit down on the floor. They laughed till the tears ran down their faces. Even President Barbicane held his hand in front of his mouth.

Captain Nicholl's face became redder—darker red, till it was almost black.

"Gentlemen! Gentlemen! said President Barbicane hitting the table again and again as if it were a drum. "Gentlemen, I must ask you to be silent. Captain Nicholl wishes to speak."

"Why don't you come with us?" shouted Ardan again.

"Because I have not been asked!" said Nicholl.

There was more laughter at this simple answer, and the laughter was against Ardan.

"Sir," said President Barbicane coming forward to the front of the table, "we shall be honoured if you will join our party."

"Sir," said Captain Nicholl, "nothing would please me more. I too like a good laugh, and I'll get one when we are safe back on the ground almost as soon as we started."

"I wouldn't be sure of that," said Dr. Belfast.

Eleven

MAKING THE SHELL

A. Dr. Belfast made arrangements for the making of the shell. He first got the use of the largest gun in the American army. He had a shell made to fit this gun; the shell was made exactly to the French scientists' plan. The trial shell was, of course, much smaller than that shell which would be fired from the great gun, but it was large enough to hold animals. Dr. Belfast wished to see if the animals remained alive after the shell had been fired high into the air and had fallen back on to a sandy place—such as might be hoped for on the moon.

A dog was put into the shell. The gun was fired so that the shell came back to earth on the sand north of Tampa. The top of the shell was taken off; Dr. Belfast looked inside. He took out the dog. It was unhurt.

B. J. T. Maston had asked again and again to join the party which was going to the moon, but Dr. Belfast said "No," and Barbicane would not allow it.

"No," he said; "Nicholl and Ardan are both small men, and I am not very big. But you are six feet tall and very broad. We would have to take you and your food, and the air for you. It can't be done!"

"Then," said Maston, "at least I can do this—I can stay for one whole week inside the shell before it is fired, shut off from the outside world, using up the air which is stored in the shell and the food and water just as it will be supplied. In this way I can make sure that everything is all right."

This was agreed.

The shell was made in the great steel works at Pittsburgh. A very big railway-car was also made to carry it because it was too big and heavy for any car on the railway. All trains were stopped so that the railway line was quite clear for it to travel over. The bridges were strengthened. Companies of men stood ready all along the line so as to act at once if anything went wrong.

All along the line thousands of people stood waiting to see the great shell go by, and shouted and waved as it passed.

The shell was three days seventeen hours on the journey, but it reached Tampa safely, and went on to Iron Mountain through crowds lining both sides of the railway line.

C. The explosive, Atomite, was also on its way. I may not say where the Atomite was made, nor, of course, how it was made. It was carried by ship to Tampa. Warships guarded it all the way.

At last the ship arrived at Tampa. From there the Atomite was carried by railway to Iron Mountain.

An order was made that no one should be allowed within five miles of the Atomite while it was on this journey. All the people of Tampa were taken out

for miles into the country south of Iron Mountain. The streets of the city were silent: it was like a city of the dead.

The Atomite was taken out of the ship and loaded on to the railway car. The train slowly and carefully passed on, round the edge of the town, and through fields where no one was working, along roads on which no car nor any living thing was to be seen. On it went, up to the mountain-top.

The boxes were taken carefully from the train and carried to the great gun. Men waited at the bottom of the gun to put the explosive exactly in place. Then more Atomite was let down to them and put in place. All this was done in the half darkness; it was not safe to have any light. At night the work stopped. Next morning it began again.

At last all was ready. The electric arrangement for firing the explosive was prepared. The top of the gun was covered over.

D. Maston, Ardan and Barbicane sat in a hut waiting for the great shell to arrive.

It came on the next afternoon. The people of Tampa had gone back to their city and were ready to see it pass by. Long before it reached the mountain Barbicane and the two others could hear them shouting.

The train came slowly, very slowly round the curve. It seemed almost as if so great a weight must fall backwards down the hill. For nearly half a minute the train seemed to stop and the wheels turned helplessly without holding the line under

them. Then something happened; the train moved forward again. Now it had almost reached the top; it went faster.

The workmen shouted as it passed their huts. On it came till it stood beside the opening of the great gun.

Twelve

INTO THE SHELL

A. December 1st had arrived! So also had the members of the Gun Club. Every house in Tampa was full.

The gun must be fired at forty-six minutes past ten that night. On the evening of December 1st the members went by train to the place kept ready for them at a safe distance. The public were not allowed anywhere above the foot of the mountain.

In an inner ring round the gun there were only Maston, Barbicane, Ardan—and Captain Nicholl, whose face was far less red than when we saw it last! But Michel Ardan's hair seemed redder than ever. Barbicane sat quietly reading a book. By his side was a dog, his much loved dog. The dog was going with them; it would show if the air inside the shell was becoming bad so that they must let in more oxygen before it was too late.

B. Murchison appeared at the door of the hut.

"Ready, sir."

Barbicane stood up: he put the book under his arm. The dog followed him out of the hut; Ardan and Nicholl walked in silence at his side.

The shell was still on its railway car, but it had been raised so that it was now point upwards.

Wooden steps had been put against its side for the travellers to climb up.

Ardan went up the steps. As he came to the top he bowed to Maston and the men; then he waved his hand, "Long live the Impossible!" he cried. Then he went down into the shell.

Nicholl followed.

Barbicane came last carrying the dog. He shook hands with Maston; "I'll see you again soon," he said. Maston did not speak.

The shell was closed. . . .

Thirteen

THE SHELL IS PUT INTO THE GUN

Thick ropes made of steel were hanging ready over the mouth of the gun to let the shell down gently into place.

Inch by inch the shell with the travellers inside it was raised up off the railway car. Now it was clear of the car . . . Now it was moving sideways . . . It was over the hole. No—six inches too far! Back! Stop! That's right. Now lower an inch—two inches. Forward a little; it is not quite over the hole. Now an inch down! Right; now lower . . . It is in the hole. Gently! Gently! A man was standing on the top of the shell, holding the steel rope in one of his hands and waving the other hand.

Suppose it fell on to that mass of explosive! The gun, and even the mountain, might be blown to pieces.

Now the whole of the shell had gone down into the mouth of the gun as if some great animal was eating its iron food. The man had gone down with it; another man on his knees was looking down over the edge and making signs with his left hand to the workers behind him.

Stop! It had reached the bottom. There was no pull on the steel ropes now; they hung in curves. The man at the edge made a sign: the ropes moved upwards. A man's head was seen coming up through the mouth of the gun. All was ready.

Fourteen

THE GUN IS FIRED

A. All the workmen climbed up on to the train; the train moved off and was soon out of sight round the curve of the line.

Maston stood there alone. He got into a car and drove half a mile to the west of the gun. There a hole had been dug in the ground. A steel hut had been built over it. The roof of the hut was thickly covered with soft earth; a very thick stone wall was built between the hut and the gun. In this hut there was a chair and a table. On the table there were only two things—a small box joined electrically to the explosive in the great gun—and a clock. It was a clock used only for scientific work; it kept very exact time.

B. The time now shown by the clock was just thirty-one minutes past ten. In fifteen minutes, at ten forty-six, Maston will press down the red ball standing out from the top of the box. This will send electricity into the mass of explosive in the gun; and then . . .? Then what? Perhaps the death of his dearest friend and of two other very brave men, or perhaps the beginning of the greatest and most wonderful journey which men have ever made.

Ten forty!

Maston stood up; he went outside the hut to take

a last look at the place where he had worked so long. He saw around him green grass, trees still green in winter because in Florida it is warm all the year round; here and there among the grass he saw flowers. It would never look like this again. He went back and sat down.

Ten forty-four.

If the red ball was not pressed down now another eighteen years must pass before the moon would be so near the Earth again. Eighteen years!

Ten forty-five. His hand rested on the ball.

Ten forty—six . . .

* * * *

C. Maston opened his eyes. He was lying on his back. Some liquid was running down his face: he put up his hand; it was blood. He sat up; then he began to remember . . . At ten forty-six . . . He looked round him; the clock was lying broken on the floor beside him. So he had fired the gun.

He stood up; then went outside. He could see nothing. Over the whole world there lay a thick dark cloud. Then, on his left, he saw a tree, burning. Weakness came over him again: he fell back into the hut.

Fifteen

MISSED

A. Tampa was shaken. Walls curved outwards and fell into the street. Roofs were blown off. Not one window was unbroken. For hours after the firing of the gun no one could hear. People shouted at each other, then shook their heads helplessly and wrote on pieces of paper.

When the smoke began to clear away there was a change in the weather; rain began to fall, and fell for days without stopping over most of the eastern coast of America. And the sky was so covered with clouds that the great telescope of Chicago University was useless.

The people of the world waited to hear what had happened to the shell. Where was the shell? Had it fallen back on to the Earth?—or deep into the sea? Or was it on its way to the moon?

B. Maston, so soon as he was well enough to move, hurried with Dr. Belfast to Mount Locke in Texas where the Chicago University telescope had been built. Every hour of the day and night they waited by the telescope, and tried again and again to see through the thick covering of cloud which shut them in.

At last the world was told the answer to their question.

Chicago University Telescope

December 6th. Mount Locke.

The shell fired from the gun on Iron Mountain, Florida, was seen by Dr. Belfast and J. T. Maston at 24.37 hours (12.37 on the night) of December 5th. It had not arrived at the moon. It passed by the side. It is 2,833 miles distant from the moon: this is near enough for it to be held by the attraction of the moon. Therefore one of two things will happen:

(1) The moon may, after some time, pull it nearer, so that it will fall down on to the moon . . . or (2) the shell may continue to travel round and round the moon until the end of time.

We hope, at a later date, to say which of these two things is happening.

Until then, the work of the Gun Club of Baltimore has added another moon to the sky - a moon of the Moon.

J. Belfast

Inside the shell there was air enough for one month. There was food and water for a longer time. But, after that, what would happen?

J. T. Maston made his home at Mount Locke. Dr. Belfast was with him. They never let the moon out of their sight. As soon as the moon came up into

the sky, one or other was at the telescope, watching it—and their three friends.

"Some day," said Maston, "some day they will come back—alive!"

"Nothing is impossible," said Dr. Belfast.

Sixteen

INSIDE THE SHELL

A. We must now go back to the inside of the great shell and see what happened there.

Soon after ten o'clock the shell (with the three travellers and their small dog inside it) was resting on the mass of explosive at the bottom of the great gun.

The inside of the shell was a small round room, with three seats and a table in it. The walls were covered with soft stuff so that no one might be hurt by being thrown against it. Under the three seats there were the stores of water and food. The arrangement for keeping the air good was in the upper part of the shell. Three electric lights were fixed on the wall.

Michel Ardan looked at everything; then he sat down.

"Well," he said, "it is a nice travelling car."

"A nice travelling prison, perhaps," said Barbicane, with a laugh.

"Or a nice travelling grave," said Nicholl.

"We have twenty more minutes to remain on the Earth," said Ardan.

There was a short silence.

"Nineteen," said Nicholl.

"Eighteen and a half," said Barbicane. He took out his book and began to read. The dog was asleep.

Michel Ardan was writing in his note-book.

"I don't see the use of writing, if no one will ever read it," said Nicholl.

* * * *

B. Barbicane put away his book.

"Ten minutes more," he said. "I think we had better lie down on the floor. That will be the safest place. Lie down on your backs. Put something soft under your head. There's nothing to be afraid of. . . ."

They did so.

"Five minutes more," said Barbicane. "I'll just put the lights out. Lie quite quiet . . . there's nothing to be afraid of."

"One minute more. There's nothing to be afraid of. . . . Half a minute: there's nothing . . ."

And then it happened.

Seventeen

AFTER THE FIRING OF THE GUN

A. On the floor of the shell there lay three bodies: they seemed to be dead.

Some minutes passed.

Then Michel Ardan opened his eyes. Soon afterwards he lifted an arm. Then he turned on his side and got on to his hands and knees. He stood up, put out his hand and turned on the electric light.

He looked at his watch—ten fifty-two; eight minutes to eleven o'clock. The gun was to be fired at ten forty-six. He had known nothing for six minutes—or perhaps the firing of the gun was late. He looked at Nicholl lying next to him, half across the body of Barbicane.

"I hope I'm not the only one alive," he said softly.

He stepped over the body of Nicholl, then looked at Barbicane's face.

"He looks bad. Nicholl is not so bad as he is."

B. He took Nicholl's arm and pulled it so that Nicholl's body rolled off the body of Barbicane.

"What are you doing!" said Nicholl with his eyes still shut. "Leave me alone—pulling me about like that!"

"Get up. You're lying on Barbicane."

Nicholl stood up. His eyes were still shut.

"Am I late for breakfast," he said.

"Ha!" said Michel. "He thinks I'm Mrs. Nicholl, and that's the way she wakes him in the morning." He began to laugh.

Nicholl opened his eyes. He began to understand.

"Here . . . In the shell. Of course. We have come back to earth, and must get out."

"Come!" said Michel. "Lift Barbicane and get his back against the wall. He looks bad."

Together they lifted Barbicane and set him up against the wall.

C. Barbicane seemed to have suffered more than the other two. Blood was running down from a cut above his left eye; but he was alive. Ardan took a piece of cloth and cleared away the blood. It was not a deep cut.

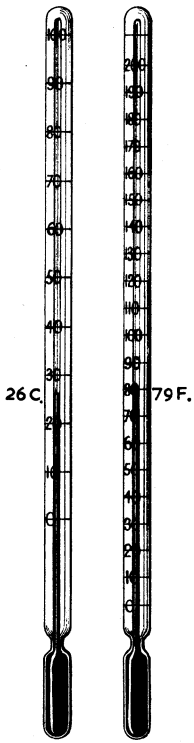
"I wonder in what part of America we have fallen," said Nicholl, "or whether we are now resting at the bottom of the sea. . . . I wonder if we have moved at all."

"Why do you say that? Do you think that we are still at the bottom of the great gun and that for some reason it was never fired."

"Yes," said Nicholl, "I do; because I never heard the sound."

"I did not hear it," said Ardan, "but something must have caused this pain in my back and this cut on Barbicane's head."

Barbicane's eyes opened. "Are we moving?" he said.



"Or quietly lying on the ground somewhere in America," said Ardan.

"Or still at the bottom of the gun," said Nicholl.

Barbicane stood up.

"It is very hot in here," he said. "Seventy-nine! Yes, we are moving. This heat is caused by the *friction* (the rubbing) of the air against the outside of the shell. But it will soon be less."

D. "It is ten fifty-nine—one minute to eleven," said Ardan. "We have been moving for thirteen minutes."

"If we have been moving at all!" said Nicholl. "I heard no sound of the gun being fired."

Barbicane went to the side of the small room and put his hand on the inner window.

"Let us find out where we are," he said. He opened the inner window; then moved the bar which opened the window in the outer shell. The three men looked out. Outside there was a black darkness.

"If we were lying on the ground somewhere in America it would not be so dark," said Barbicane. "The light would be thrown in to us from the ground."

"Therefore," said Nicholl, "we are at the bottom of the sea."

"No!" cried Ardan. "Look over there! There are stars."

"So we *are* moving," said Nicholl. "Well, I was wrong!" He turned to Barbicane. "Now, sir, let us be friends on this journey which I suppose may be our last—but let it be friendly."

They shook hands.

E. "But where," said Ardan, "where is the moon?"

"You cannot see it from this side," answered Barbicane. "Let us look out of the other window."

The three men stood for over an hour looking out at the starry sky and upwards at the bright silver of the moon moving across towards the end of their course. In less than ninety-six hours they would be there—where man had never been before.

Ardan was looking out from one of the side windows, and Nicholl, now more friendly than in the past, was naming the stars.

"What," asked Ardan, "is that very large thing over there?"

"Barbicane! Barbicane!" cried Nicholl. "Quick!"

This new thing seemed to grow larger and larger. It seemed to be coming straight towards them. Fear was on all their faces: perhaps this journey was going to be a very short one.

"It's going to run into us!" cried Ardan.

They drew back from the window. . . . And then it was gone. It passed them by.

"You would think," said Ardan, "that with all space around us we might pass without fear of being

run down as if we were crossing the road in Paris! What was that thing?"

"It was a *meteor*," said Barbicane. A meteor is a piece of a star which has been broken off and is travelling through space.

F. "But," said Ardan, "I thought that meteors were very bright shining things: they are also called 'Shooting Stars' in English, aren't they? But that thing was not very bright."

"That's right. But shooting stars do not become bright until they come within the air around the Earth. The friction (the rubbing) of the air against the meteor causes it to become very hot, and small meteors (which are also called shooting stars) are burned up before they reach the ground. But this is a big meteor. It has come within the pull—the attraction—of the Earth: it is not pulled down on to the Earth, yet it cannot get free from it. So it has become a second moon."

"So the Earth has two moons?" said Nicholl.

"So some scientists believe—although others do not think so."

"Well, now we know that those others are wrong; but why is it not seen from the Earth?"

"It is not seen because it is too small, and its movement is too fast, and it is not bright. This meteor was believed to go round at a distance of 4650 miles from the Earth. So now we know where we are."

"So now we know!" said Nicholl. But I think I would rather be 4650 miles back from this place."

G. Barbicane closed the side window.

"Let us now look back upon the place from which we came," he said.

He opened the window in the bottom of the shell. As they looked down they saw a curved silver line in the sky; the rest of the Earth was in darkness; the sun was on the other side. That silver curve was not clear like the curved edge of the moon: it was softened by the clouds around it. . . . So that was the Earth!—that weak silvery curve nearly five thousand miles away—down there."

"Well," said Nicholl, "I don't suppose we shall ever see the place again. "We have seen the last of our poor little home. I don't know why we left it!"

"Yes," said Ardan, "we have certainly left it behind. Goodbye dear France! But tell me, Barbicane, why did we not hear the gun fired?"

"Because," answered Barbicane, "we were travelling faster than sound. The sound has not reached us yet. It will never reach us now, because there is now no air around us to carry the sound. . . . Let us have a meal—the first breakfast we have ever had so far away from home. And I expect the dog will be glad to have some breakfast too. I have heard no sound from him."

He opened the box in which the dog had been put.

There was silence.

Then Barbicane stood up.

"The dog is very ill," he said, "I think he is dying."

Eighteen

DECEMBER 2ND

After a meal the travellers slept. They slept well after their sufferings.

The night passed; but we cannot call it "night": in the shell it was neither night nor day. Night and day are words which can be used only of the rising and setting of the sun on the Earth. Perhaps they slept well because of the movement, but in the shell there was no feeling of movement: we feel ourselves move because we see things go past the window of the railway carriage; but the Earth is moving round the sun much faster than any railway train: we do not feel it move. The travellers inside the shell felt no movement at all.

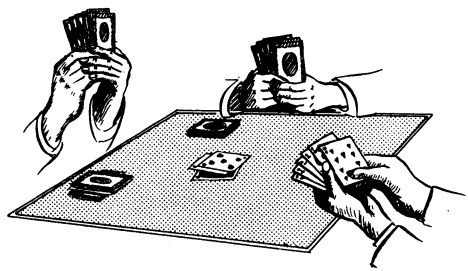
When they awoke on December 2nd they each set themselves to some useful work which needed to be done. Barbicane went first to his dog: but the dog was no better. Then he made a trial of the air to make sure that those arrangements were working and that the air was still good.

Michel Ardan looked at the supplies of food.

Nicholl was sitting, writing in a note-book. He was covering its pages with x and y and z and other signs.

Barbicane came and sat reading his book. From time to time he went and looked at the dog. So the

morning passed. They had a midday dinner (if it can be called "midday"; it could equally well be called midnight). They slept a little afterwards. They played a game of cards. They slept.



Nineteen

DECEMBER 3RD

A. Next morning Nicholl was still working at his note-book. From time to time he said numbers aloud: "Seven times 62,387 is . . ." Then he began to write again. Then "Yes; that's right . . . and *that's* right, and THAT is right. So where is my mistake?"

After their meal they slept and then played cards as before.

"Now I'll lie down and have some sleep," said Barbicane, after looking at the dog. "He's no better. I don't think he'll live till to-morrow."

"I will not sleep," said Nicholl, "I want to go over this again. I can't make it come right. . . ."

"What is it?" said Barbicane.

"Now that we have left the Earth I wanted to know whether we shall ever reach the moon, and (if we do reach it) exactly when we shall arrive. You asked those scientists at Chicago to work out the exact length needed for the gun, the exact weight of the shell and the exact amount of explosive needed?"

"I did. I could have worked it out myself, but I thought it better to leave it to them."

"Look at this paper. Have I got the weight of the shell right? Is the amount of explosive right? Is all the rest of it right?"

Barbicane looked at the paper. "Weight of com-

plete shell—so much; yes, that's right. Explosive—yes."

"But if that is the weight of the complete shell, that amount of explosive will not carry it as far as the place where the moon will begin to pull it down towards itself! We shall travel for not more than fifty hours at the most, and then we shall fall back on to the Earth!"

"You can't be right," said Barbicane. "They are world-famous men; they could not have made a mistake. And they went over the whole thing again after the French scientists changed the plan of the shell. And the French scientists did it too. They can't all have made a mistake."

"Well, if I have made a mistake, look at these papers and tell me where the mistake is."

Barbicane took the papers and sat down at the little table.

After a time he looked up. "Captain Nicholl," he said, "you have worked for many years on ships; you can read the stars and tell where a ship is. You will find all the things which you need in this box; take a look at the stars and try to tell where we are and which way we are moving."

"I will help," said Ardan. "I have served many years on a ship. I was sea-man before I was Danger-man."

B. Barbicane went on looking at the papers.

After a short time he looked up and said, "So far as I can see Captain Nicholl is quite right. We must be falling backwards."

Almost at the same moment Nicholl turned from the window and said, "Barbicane, you're quite right. We are moving forward."

"We have been travelling for over fifty hours," added Ardan; "so we ought to be falling."

"So," said Barbicane, "we are both right."

"But that is impossible!" cried Ardan. "Let me see the papers. The weight of the complete shell was . . . What do you mean by the complete shell? Do you mean the shell with that oil-containing part which saved us from being shaken to death, but did not save Barbicane from a cut on his head: or do you mean the shell, as it now is, without that part which fell off from us when the shell left the gun?"

"Ah! I am a fool!" cried Nicholl: "I took the weight of the complete shell *with* that part."

"And I am no less a fool," said Barbicane, "because I did not see your mistake. . . . Let us get some sleep."

Twenty

A SKY GRAVE

A. December the 4th was passed in reading, sleeping, and talking about the moon. Ardan seemed to be quite sure that there must be some living things on the moon, and asked many questions of Barbicane on that point.

"No," said Barbicane; "so far as is known there is no air on the moon. There may be air remaining in the lowest and deepest parts—at the bottom of a very deep hole called Newton, or in other places. There may be air at the back of the moon which, of course, we never see. But so far as is known there is no air, no water, no life."

"I shall go on hoping to the last," said Ardan. "There must be something living in all that big place!"

On December the 5th, their last day, they decided to get up very early.

Each morning Michel Ardan, when he first got out of bed, did arm and leg movements for his health. "Arms in! Arms out! Arms bend! Legs bend!" and so on. Then he jumped up and down moving his arms as he did so.

On the morning of December the 5th Ardan jumped out of bed, but he jumped with such force that he went right across the small room and fell on Nicholl who had not yet awoken. Nicholl was

angry at being awoken from sleep by having a Frenchman fall on him.

B. Barbicane was already awake; he went across to see how the dog was. The quarrel between Nicholl and Ardan was cut short by a cry from Barbicane.

"What is it?" said Ardan moving across to him. "What has happened?"

"My dog," said Barbicane, "My dog! He is dead."

There was a sad silence. They both knew how much Barbicane had loved his dog.

"I am sorry," said Ardan, "deeply sorry. He has died for Science."

"And I too am sorry," said Nicholl; "he was a nice dog, a fine fellow. If he had only been willing to stay on the ground, he might have lived to a great old age."

"There is one thing which I do not quite understand," said Ardan. "I believe that English people like to dig a nice grave for a much loved dog, and put up a little stone, 'Here lies my dog, Fido.' But I do not see how we can dig a grave here."

"No," said Nicholl, "nor can we keep the dead dog in this small space until we reach the moon and dig a grave there."

"We must put the body outside," said Barbicane. "But it must be done very quickly and carefully. We must open the inner glass window first. Then put it in; then close the inner glass window and open the outer steel window, and then open the outer glass window, so that it may fall out."

C. "Why cannot we open both the windows at once and throw it out?" asked Ardan. "That would be quicker and easier."

"Because," said Barbicane, "we should all certainly die."

"We should die from the great cold," answered Nicholl, wishing to show how much he knew. "Outside this shell there is no heat at all; it is colder than the coldest part of the Earth, colder than the Furthest North or Furthest South of the Earth."

"But that," said Barbicane, "is not the only reason why we would die. It is cold outside this shell because there is no air to store up the heat of the sun. The sun shines on the Earth by day and the air round the Earth stores up this heat, and the seas and the land store up heat, so that at night, when the sun is not shining, the Earth is still warm. But out there, outside this shell, there is no air: there is no sea nor land: there is nothing to store up the sun's heat. Out there there is no stored heat at all. But that is not the reason why we would die if we opened both the windows."

"If I am frozen to death," said Ardan, "that would be a very good reason for dying. But if we shut the window quickly we could soon warm up this little room again."

"If you opened both those windows together," said Barbicane, "all the air contained in this shell would go out. All this time it is pressing outwards against the sides of this shell, trying to get out. Open those windows and it would all flow out. Having no air is another very good reason for dying."

D. "But," said Ardan, "we could shut the window very quickly and that oxygen-making arrangement would soon supply more."

"It would supply more oxygen, but oxygen is only one part in every five of air. Other parts of the air are necessary to life, and the pressure (the pressing) of the air all round you is necessary to life; without it you would swell out to four times your present size and explode."

"Ah, I understand now," said Ardan. "I may freeze to death, or I may die for want of air, or I may swell up and explode—which ever way I like."

"That is so," said Barbicane. "So let us be very careful about the way in which we give my poor dog its sky grave."

The inner window was opened: the dog's body was put in between the windows. When the inner window was safely closed the outer windows were opened and the dog was seen no more. The outer window was closed, and they turned back into the room.

It was Nicholl's work to put the things on the table for breakfast. Ardan was still doing "Arms bend, legs bend"—and the rest.

"Keep still!" cried Nicholl. "How can I keep these things on the table if you are jumping up and down?—there, the cup has gone off again!"

E. Michel Ardan stopped, but Nicholl still seemed to have trouble.

Another cup fell slowly from Nicholl's hand; but

it did not fall down to the floor and break. It went slowly down as if it were made of thin paper.

"You do not like my 'Arms bend' but it is very good for the health," said Ardan. "I have been shut up in this little room for three days and I have not become fat nor put on weight."

Barbicane had joined them.

"No," said Barbicane, "you have not put on weight. You have lost weight." He took a cup from the table and held it in the air; then he took away his hand; the cup stayed there! It was not held up by anything. He put a cup at the side of it; it stayed there. All the things in the room were the same. Nothing stayed on the floor. And the three men had strange feelings.

"I don't want breakfast," said Nicholl: "I am seeing things which are not real, and I don't feel well. I'll lie down."

"I think that would be wise," said Barbicane. "I should have thought of this. It will be better later on. But just now—at 187,210 miles—this was to be expected."

F. "Is there some magic power at this place which makes everything—even my own inside—act so strangely?" asked Ardan.

"There is no magic power," said Barbicane. "Our troubles are caused only by losing weight. What is your weight, Ardan?"

"One hundred and fifty pounds."

"It *was* 150 pounds on the Earth, that means 'the Earth pulled you downwards with a force of

150 pounds'; the pull of the Earth on your body was 150 pounds. The Earth is about six times as large as the moon. So the attraction of the moon will be six times less. Your 'weight' on the moon will be twenty-five pounds. How high can you jump?"

"At school," said Ardan, "I once jumped over four feet."

"On the moon," said Barbicane, "you will jump up twenty-five feet quite easily. This morning you jumped on to Nicholl in getting out of bed. You gave your usual jump out of bed, but you have not your usual weight. Just at this time, at a distance of 187,210 miles, you have almost no weight at all. The pull, the attraction of the Earth and the pull of the moon are almost equal. The shell is not pointing at the moon now."

G. "What!" said Ardan. "Aren't we on our way to the moon now? Where are we pointing?"

"I do not know," said Barbicane. "The shell may be pointing anywhere. But I expect that the point is now towards the Earth."

"Then we are going back?"

"No, we should have turned over; the bottom of the shell is heavier than the top. I expect that the pull of the moon is now a little greater than the pull of the Earth. So the bottom of the shell should be towards the moon, and we are falling bottom downwards, towards the moon. Let us see if I am right. We will open the windows and see. You, Ardan, open the window at the side, and I will look out through the bottom window."

Before Barbicane had opened the bottom window, there came a loud cry from Ardan.

"What is it?" asked Barbicane. "What is the matter?"

"Another meteor! A black one! And very near!"

Barbicane went quickly to the window.

"I see nothing," he said.

"No," said Ardan, "it has gone. It passed quickly by, very close. We are saved!" But he stood there, looking out, as if he feared that it might come back.

Before going to open the lower window Barbicane looked again in his note-book. He stood thinking.

"Yes," he said, "it should have turned over by now, and we should look straight down upon the great central plain of the moon from our bottom window."

H. Barbicane began to open the window, when he heard a cry from Ardan, louder than before.

"It has come back! The Black Meteor has come back."

Barbicane hurried across to him.

"Where is it?" he said. "Where?"

"There! . . . No! It has gone. We are saved a second time."

Barbicane was thoughtful.

"If it has come back once," said Barbicane, "perhaps it will come back again and then I shall be able to see what it is." He waited. Nicholl joined them.

"There!" cried Ardan at last. The three men

looked out. A strange thing passed by the window. It looked like a bag, but it had a head and four legs. It was the dog—the body of the dead dog which they had put outside.

"Of course!" said Barbicane. "We might have expected it. When we put the dog outside, what did you expect it to do, Ardan?"

"I expected it to fall."

"Fall where?"

"Back on to the Earth."

"Why? We are not falling back on to the Earth. We are falling on to the moon."

"Then let it fall down on to the moon," said Ardan, "but I do not want it to follow us about as if we had killed it. Let it fall down on to the moon and leave us."

"But it *is* falling down on to the moon; and so are we. In the air some things fall faster than others because the air slows down things which are not heavy but large. When there is no air all things fall together: a feather falls as fast as a piece of iron. So the dog is falling as fast as we are falling. As the shell falls the dog is going round the shell and falling with it. You may think of the dog as our moon."

"I have heard of a Dog Star," said Ardan, "but I have never heard of a Dog Moon!"

Barbicane had not yet looked out through the bottom window to see if the shell had in fact turned over as he had said. He went back to the lower window.

"The bottom of the shell," he said, "should be turned towards the moon now, so that the moon will

fill the whole space of the window. Let us see if I am right?"

They opened the window.

"There it is!" cried Ardan. "There is the moon, over towards my right."

"Yes," said Barbicane, thoughtfully, "yes, there it is—at the side. So the shell is turning over, but it has not turned right over as I expected. . . . That is very strange."

Twenty-one

DECEMBER 5TH, MIDNIGHT

A. At midnight of December the 5th the moon would be at its nearest point to the Earth: at midnight, December the 5th, the shell should fall on to it. Barbicane had now no more fears about getting as far as the moon: the shell had passed the danger line; it could not now fall back on to the Earth.

The chief fear of the French scientists who planned the shell was that it might fall on to the moon with such force that it would be broken to pieces, or that the men inside it would be killed. When the shot left the gun the oil-arrangement had guarded it from the force of the explosion: that thing fell off after the shell was fired. But in the bottom of the shell there were a number of large egg-shaped containers. These were rockets. The French scientists planned that these rockets should be used to drive the shell upwards, away from the moon with just enough force to make its fall on to the moon slow and gentle.

Barbicane looked at these; he saw that all was in working order.

One fear was in his mind; he feared that the shell might fall on a mountain-side and roll down to the bottom. That would be very unpleasant for the three men inside it: it might be more than un-

pleasant, it might break arms or legs or even cause their death.

B. The central part of the moon, as seen when it is Full Moon, is a large plain. The great gun was pointed at the exact centre of this great plain. If all went well the shell would arrive safely on that plain; but if it went a little to the side of the great central plain, it would fall among high mountains and this danger would be very real.

It was now the evening of December the 5th. Barbicane went and opened the lower window and looked out again. Then he went and sat down. He pulled out his note-book and began turning over the pages.

"Why! Why! Why!" he said. "Am I wrong? Or—what?"

Nicholl saw that Barbicane was unhappy about something. During these days together the two men had become more and more friendly.

Nicholl went and put his hand on Barbicane's arm.

"What is it?" he said; "what is the matter?"

"Something has gone wrong. Either the scientists at Chicago were wrong—or I am wrong—or the moon is wrong!"

"Why?"

"By this time the shell should have turned right over; it should be falling straight down on to the great central plain of the moon. But . . ."

"Well," said Nicholl. "Does it matter if we fall sideways?"

"It matters if we fall on a mountain-side and roll down many thousands of feet jumping from rock to rock. Even if the shell is not broken to pieces, we may be broken to pieces . . . And I fear something else."

"What is that other thing—that something else?"

"Let us wait. It may not be true, and then I shall have caused you unnecessary fear. But why? Why? Why has it not turned over? Why are we not falling straight?"

"Well, Barbicane, I never expected to fall at all—except back on to the Earth. And if I don't fall there, I don't care very much about where or how we fall."

C. Barbicane sat turning over the pages of his notebook. At about nine o'clock he looked out again.

The whole window through which he looked down was filled with bright silver. The shell had turned over; it was falling towards the moon. But that part of the moon which he saw was not the central plain; it was high mountains with rocky sides.

"Well," said Nicholl as he joined Barbicane. "It looks as if we are going to hit it—but not where we meant to."

"We are late!" said Barbicane. "It is now nine thirteen. We are moving, and the moon is moving. Where will both be—the moon and the shell—at midnight? That mountainous part which we now see may have passed."

"You mean," said Ardan, "that we may not only

miss the central plain, but we may miss the whole moon?—That would be very bad shooting."

"Are you quite sure . . .?" began Nicholl.

"I am quite sure that the gun was pointed exactly right. I am quite sure that the time and place of the moon were worked out exactly right."

"But the explosive? Can we be sure that its force was not just a little less or more than was expected?" said Nicholl.

Nicholl looked at Barbicane, but he knew the answer himself and gave it when Barbicane did not speak.

"No two pieces of explosive are ever exactly like each other," he said: "no two shots fired from the same gun at the same place ever hit exactly the same point: one is a little higher, another is a little lower, because the wind changes, and because the explosive is never exactly the same. These small differences do not matter much on the Earth. A difference of one inch in one mile is a small thing. But one inch in one mile is four miles in 253,000 miles."

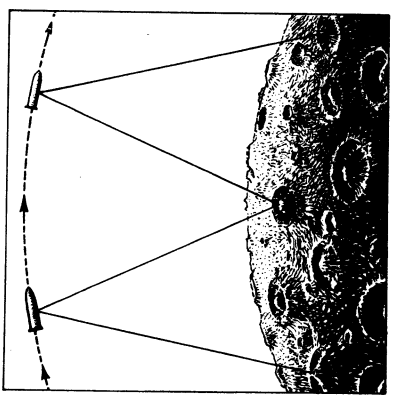
"Well, even that is not much," said Ardan. "The moon is two thousand miles across; so what is four miles one way or another."

"But," answered Barbicane, looking first at Ardan and then at Nicholl, "but the mistake is far more than that. It is past nine o'clock. In two hours more we ought to be down on the central plain. We are nowhere near it. We are hours late and hundreds of miles off our course. Why? Why?"

There was silence.

D. Then Barbicane turned to Captain Nicholl. "What would you do if this was a ship? If you were being carried along past the shores of an unknown land, and you wanted to know where you were going, and whether you were coming on to the land . . . or not."

"I would take measurements as we did before. I would get a line to that mountain there, and another to another mountain. I would go on doing this again and again, and so I would find out what was my course. I would find if I was going in a straight line or a curved line."



"And could you find out how fast you were going?"

"No—not exactly, but I should know *about* how fast."

"I ask you to do that. When can I have the answer?"

"The more time you give, the more exact my answer will be."

"One hour?"

"One hour and a half, and I will go on after that to make more sure."

Barbicane sat down quietly with his book: great men do not walk up and down and talk to themselves and make a noise when they are waiting to

see what happens. They just wait. There is nothing more they can do; so they do nothing.

Ardan had been in danger so often before that it was nothing new to him. He began to get ready their evening meal.

"We must have a meal before we come down on the moon."

At ten-thirty Barbicane stood up; he went and sat near Captain Nicholl, but said nothing.

For some time Nicholl did not speak. Then he said, "I cannot tell exactly how fast we are falling, but we are not falling faster and faster. In both my measurements the fall was almost the same."

"Ah! And our course?" asked Barbicane.

"It is becoming curved, I think. But the time is too short: ask me again later. . . ."

* * * *

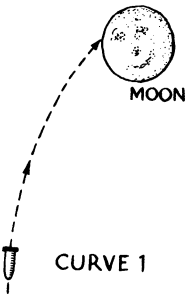
E. It was now midnight of December the 5th. They had not fallen down on to the moon. The shot had missed!

The three men sat round the table with sad faces. What would happen now? That was the question.

"There are two forces acting upon us," said Barbicane. "One force is pushing the shell forward past the moon: that is the same force which brought us here from the Earth. As there is no air that force does not become less. The other force is the attraction of the moon, pulling us inward—in towards itself."

"Well," asked Ardan, "which force is stronger? Where are we going?"

"If the attraction of the moon is stronger," answered Barbicane, "our course will be Curve 1, like this one."

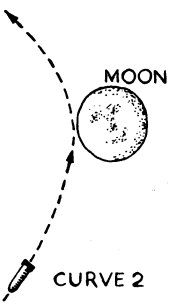


He drew on a piece of paper.

"The course of the shell will curve inwards towards the moon. It will get near and nearer. . . ."

"I understand!" said Ardan. "It will get nearer and nearer until the shell hits the top of one of those high mountains. Give me Curve 2. Where will Curve 2 lead us?"

"If the other force is stronger the shell will curve a little towards the moon and then curve outward and go on past the moon; like this:"



F. "And where will we go then?" asked Ardan.

"No one can say. We shall go out into space. The shell may be attracted by some other world."

"Or," said Nicholl, "a meteor may hit it."

Barbicane jumped up: his chair fell over behind him. His book fell on the floor.

"A meteor!" he cried.

"Why not?" said Captain Nicholl. "We nearly met one before."

"The meteor. *That* is the answer. That is why! I have asked why? why? why? Why didn't the

shell come down on to the moon as we had planned? The answer is that meteor."

"But it did not hit us," said Ardan, "so it did not make any difference."

"It did not hit us, but it passed very close, and its attraction was strong enough to pull the shell hundreds of miles off our course."

"And now do you know whether we're going to get nearer and nearer until we hit a mountain-top, or go off to nobody knows where?" asked Nicholl in a quiet voice. "When I'm travelling, I do like to know where I'm going."

"Only time can show that," said Barbicane.

Twenty-two

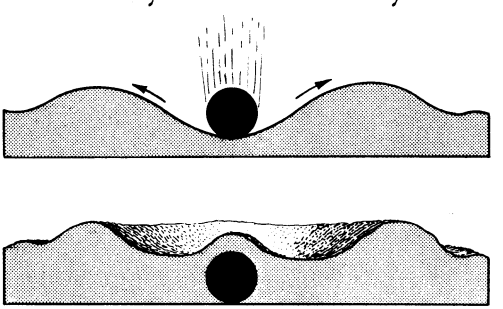
NORTH OF THE MOON

A. The course of the shell was carrying it towards the northern part of the moon. As it travelled Nicholl was measuring its distance from the moon: he took one measurement after another all the time. Ardan helped him.

Barbicane was looking at a map of the moon and naming the mountains and plains as they passed over them.

At midnight the shell was 750 miles distant from the moon moving towards the northern part of a place called on the map "Plain of Clouds."[1]

The shell passed over this plain and came to Mount Copernicus: it is over 10,000 feet high. On one side of it they could see Mount Kepler, and on the other side a long line of mountains called Apennines. As they looked down they could see quite clearly the strange rings with which the moon is covered. If you drop a stone into soft wet earth you get such a ring, with such a raised part in the centre.



[1] See the map on page 92, and notice that North is at the bottom of the map because the map is drawn looking up at the moon from the Earth.

Perhaps, when the moon was soft and partly liquid, thousands of meteors fell upon it and caused these rings. But no one knows for sure what was the cause.

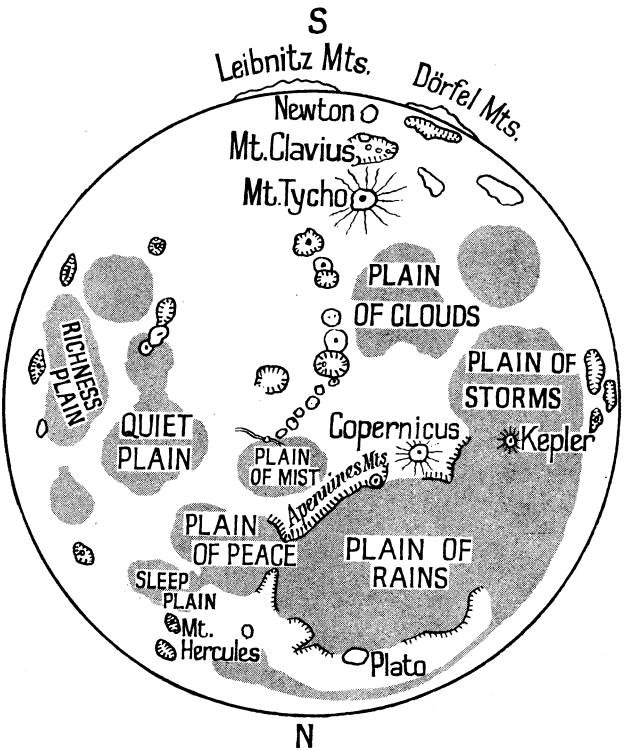
B. At one o'clock Nicholl found the distance to be six hundred miles: so the shell was getting nearer to the moon.

At two o'clock the distance was five hundred miles. Red and grey marks could be seen in the lowest parts between the mountains; these colours might be caused by the growth of plants in these lower places where some air might still remain; or perhaps the colours were the colours of the rocks themselves.

They passed over a part marked on the map "Plain of Rains"—though there was no rain; it was a dry plain. At about eight in the morning they could see a black mark in front of them. Barbicane, looking at his map, found that it was a ring called Plato. This ring is fifty miles across and the hole in the middle is very deep; it showed as a black shadow.

At three in the morning the shell seemed to be so near the moon that Michel Ardan talked about jumping out!

At four o'clock in the morning the shell passed from light into darkness. The change was not a slow one, like the change from day to night on the Earth; it was a change like turning off the electric light in a room. Now it is light—now it is dark! The shell was now passing round the moon to the side which



(Based on a map in J. A. Thomson, "Outline of Science", Vol. I, published by the Waverley Book Company, Limited)

is never seen from the Earth. It was quite clear that, in passing round, the shell must have gone very near. Why had it not fallen down on to it? But it was now no longer possible to measure the distance.

C. "Where are we going now?" asked Nicholl; "round the back—or out into space to visit Mars or Venus or some other world?"

"We are like men on a ship sailing in the dark through unknown seas," said Barbicane; "all we can do is to wait. If we could only see the moon we would know whether we are going round it or going away from it. But we cannot."

Barbicane and Nicholl began to get a little sleep while Ardan watched, promising to wake them if anything happened. But after a time Barbicane found that sleep would not come, so he went and sat at the table, reading.

There was a deep silence.

Ardan gave a cry. Nicholl woke up and came across to them.

"What is it?" he said.

"A meteor!" cried Ardan.

A strange light began to fill the inside of the shell. Barbicane ran to the window where Ardan was standing but Nicholl quickly looked down through the bottom window: he wanted to see the moon by the light of the meteor. He wanted to see if the moon was still in sight.

The meteor looked like a moon, but it was far brighter. It was too bright for them to look at it long, even with dark glasses. Both Barbicane and Ardan were resting their eyes when a very bright white light filled the room. They looked out. Without a sound the meteor had exploded. Flying pieces of white fire were thrown wide over the black sky, striking each other and breaking up into smaller pieces. They ran to the lower window where Nicholl was looking out. A white light lit up the moon.

"It's still there," said Nicholl. "The moon is still there. We aren't going away."

"Then look at it while you can," cried Barbicane; "you are seeing what Man has never seen before; you are seeing the BACK of the moon!"

Almost as he spoke, darkness came again.

Ardan said that he had seen cities and fields and wide roads, lakes and trees.

"And men fishing, and girls gathering flowers?" said Nicholl.

"You are laughing at me," said Ardan. "What did *you* see?"

"I? I saw that the moon is still there and we have not gone off to visit any other world; that's all I wanted to see."

"Many meteors strike the moon," said Barbicane, "but they are black; they give no light. This meteor was bright. It was bright because it was just going to explode. What forces within the meteor made it explode? Or did another smaller meteor strike it? Perhaps . . ."

"Perhaps," said Ardan, "another meteor may strike us, and then where shall we be?"

"In very small pieces," said Nicholl.

"Or only gas," said Barbicane.

Twenty-three

ROUND THE SOUTH OF THE MOON

A. The day passed—if a time of complete darkness can be called a day. At last, in the evening Nicholl called Barbicane.

"I think that I see something."

Barbicane hurried to see what it was. It was a line of little points—little silver points in the darkness. As they watched, the points became larger and brighter, and joined up into line.

"It is the sunlight!" cried Barbicane. "Those points were the tops of mountains. We are coming round the south of the moon!"

"So," said Nicholl, "the curve is not Curve 1, which would bring us down on to the moon; and it is not Curve 2 which would carry us off into Space; but it is Curve 3 which—which will do—what?"

CURVE 3

"Curve 3 is a closed curve," answered Barbicane. "It is a curve rather like the course followed by the Earth in going round the sun."

"You think that we shall travel round and round

the moon just as the Earth travels round and round the sun?" said Ardan.

B. Barbicane thought for a time before answering. Then he said, "Yes; but . . ."

"But . . . what?"

He drew on a piece of paper. "You see here is the moon; and there is the Earth over on the right. And this is the shell going round and round the moon as I have said. Now at one point the shell is almost mid-way between the attraction of the moon and the attraction of the Earth."

"And what will we do there?"

"Nothing—perhaps we may stay there."

"There is a French story about a donkey," said Ardan. "It wanted to eat, and on its right there was a box of nice food: it wanted to drink, and on its left there was a bucket of water. But its desire for food and its desire for water were so equal that it could not eat first, nor drink first. And so it died."

"Just so," said Barbicane.

The two men, Nicholl and Ardan, could not get any more answers out of Barbicane. He was thinking about something; his thought was not yet clear and he would not tell anything more about it.

The shell was now passing round the south of the moon. Barbicane was again looking at his map. He pointed. "There, at the south, you see the Dörfel Mountains, and the Leibnitz Mountains: we are passing between them. There are white marks on their tops which may be snow—or they may be only white rocks which look like snow.

Now we are coming to Newton: it is a very deep place, 140 miles long. See that high mountain near it. That is nearly as high as Mount Everest on our Earth. It throws a black shadow over the plain so that no one knows how deep the bottom of Newton may be."

C. They looked down upon the black hole below them. The shell passed on and they saw one of the most beautiful mountain-rings on the moon. The sides of it were not high—only about 17,000 feet, but the ring was 140 miles from side to side. Inside the ring they could see five smaller rings.

"That," said Barbicane, "is Clavius."

They passed on, and came to Tycho, a deep ring among many smaller rings as if hundreds of small stones and one big stone had been dropped into soft wet earth.

"Ah," said Ardan, "if a city were built in the centre of that ring of mountains, how safe it would be!"

As the shell passed beyond Tycho, the mountains and ringed plains seemed to become smaller.

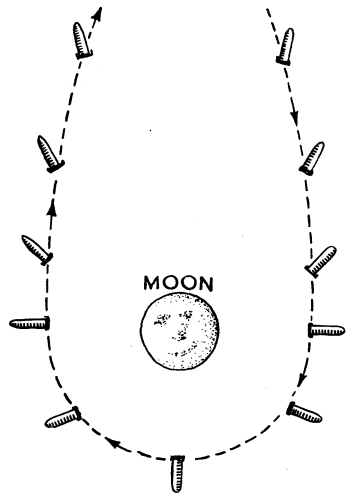
"It is strange," said Ardan, "that as you go northwards on the moon the mountains become less high."

Barbicane turned to Nicholl. "Take another measurement of distance. Are we going further away from the moon?"

Soon afterwards Nicholl said, "You are right. We are going away from the moon. The distance is becoming greater and greater with each measure-

ment! And there is something else! The shell seems to be turning its point so that we are more sideways to the moon. Can that be so, Barbicane?"

"It is what I had hoped for. Thank God! The one chance has come to us. See here. That is what is happening.



This drawing shows how the shell is turning as it moves round the moon. As it comes round the south of the moon it is turning more and more sideways."

Twenty-four

ECLIPSE

A. "There is something which I do not understand," said Ardan. "It is now midday on the moon; the sun should be shining full on to it. But the light seems to me to be becoming less. Have you noticed that, Nicholl?"

"I thought so, but I can't believe it. I thought that perhaps my eyes were tired."

"The light is becoming less?" asked Barbicane.

"Yes. It's getting quite dark."

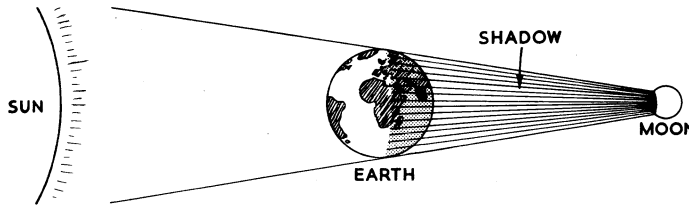
Barbicane hurried to the upper window, and looked out. . . .

As the three travellers came from the Earth to the moon, they were looking down on to the moon, wondering if they would reach it. Now, as their shell came round the back of the moon and was pointing at the Earth, they looked upwards into the sky and saw it as a person living on the moon would see the sky. It was a strange sight.

The sky was black. The blueness of the sky as seen from the Earth is caused by the air and the water in the air: the light of the sun is broken up in the air and this causes the blue colour. But there is no air round the moon; so the sky is black.

B. In that black sky the Man in the Moon sees the Earth as his moon. But it is four times as wide as

our moon. At midday on the moon the Earth is between the moon and the sun. Usually the Earth is not in a straight line between the sun and the moon, but on this day it was in a straight line so that the shadow of the Earth was passing across the moon.



Ardan was right: it *was* becoming darker!

Then a very strange and wonderful thing happened. There are no bright colours on the moon—only the red and grey of the lifeless rocks: daylight comes like turning on an electric light in a dark room; and at sunset the light goes out just as quickly. There is no slow darkening of the sky; no red and gold lighting up the sea and land as on the Earth. But now streams of golden and blood-red light poured down upon the moon making rich green and blue shadows, so that the whole moon was an ever-changing mixture of bright colour.

Nicholl and Ardan looked at the sight in silent wonder.

"I never saw the moon look like this!" said Ardan. "Why is it?"

"It is an eclipse of the sun by the Earth," said Barbicane. "The air round the Earth breaks up the

sunlight into colours, as it does at sunset and sunrise on the Earth: but now that coloured light as of Earth's sunset is shining upon the moon. This is the only time when you see the colours of sunset on the moon—when the Earth is in a straight line between the sun and the moon. We have seen the moon when it is most beautiful. Take your last look!"

Twenty-five

THE GREAT FALL

A. "Take your last look at the moon," said Barbicane as he sat down again at the table and looked at the drawing which he had made only a short time before.

"What do you mean?" asked Nicholl. "Are we going to be killed? Is a third meteor coming to change us into gas? Or what?"

"I think," answered Barbicane, "that we ought to go back to the Earth now."

"And how are we going to do that?" said Ardan. "How can we decide where we will go? We are rolled about by the attraction of the Earth, the attraction of the moon, the attraction of meteors, and so on, and so on. No one asks us what we want or where we want to go. And now Barbicane speaks as if we could call a car and say, 'The show is ended. Drive us home, please.' "

"I think we can do it," said Barbicane. "Look at this paper again. We are now coming to the point of our course furthest from the moon. At that point the attraction of the Earth and the attraction of the moon are almost equal. If we do nothing I believe that we shall in the end be drawn again towards the moon and travel round it again—and again. But there is one thing which we can do: that thing will force the shell out from the attraction

of the moon and bring it within the attraction of the Earth; so that we shall fall back on to the Earth."

"Ah!" cried Nicholl. "Of course, the rockets!"

"Just so. Those rockets were meant to make us come down more gently upon the moon. When we reach that furthest point of our course—when we are, like Ardan's donkey, just mid-way between the two attractions—we will fire the rockets. Little food or air is now left to us. It is time for us to go. Shall we decide on that?"

B. "I do not quite understand one thing," said Nicholl. "I understand that, if we stay here, we shall die because sooner or later we shall have no more air and food. Perhaps, with care, we may last out for a few weeks. But, if we go back to Earth, we shall *fall* there. We shall fall from a height of thousands of miles, faster and faster. When we reach the Earth we shall be travelling thousands of miles an hour. We have no rockets to make our fall gentler; those will have been used."

"That is so," said Barbicane.

"The question in my mind is 'On to what shall we fall?'"

"Let us hope that it is something soft," said Ardan. "What are the chances?"

"The chances are three to one," said Barbicane. "Three-quarters of the Earth is covered with water. So the chances are three to one that we shall fall into the sea."

"Well," said Ardan, "I do not understand why you sound so hopeful. Is it any better to lie at the

bottom of the sea than be broken to pieces on land? What hope is there for us either way?"

"Someone might see us fall into the sea and pull the shell up?" said Nicholl.

"Someone may," answered Barbicane, "but I am not thinking of that. I do not think it will be necessary."

"Ha! Ha!" laughed Ardan. "You mean that it is not necessary to pull up three dead men from the bottom of the sea. Let them stay there!"

"Let us talk about that later. First let us get some sleep. The rocket must be fired at exactly one o'clock. I will set the clock to wake us a few minutes before the time."

* * * *

C. As the travellers lay sleeping the shell came nearer and nearer to the mid-point between the attraction of the Earth and of the moon; and as the attraction became more equal their weight became less and less. They were nearing the point where things have no weight at all. A book seemed to rise up off the table and go slowly and gently down on to the floor. A chair was hanging in the air as if held there by an unseen hand. A cup came slowly down from a shelf and lay lightly on Ardan's face. He woke up just as the clock started to ring. He jumped up, hit the roof, and then came gently down to the floor.

Barbicane and Nicholl woke up. Then the three men stood waiting.

"Five minutes to one," said Nicholl.

"All is ready," said Ardan, ready to press the bar which would send electricity to fire the rockets.

"Wait!" said Barbicane. "I shall count Ten, Nine, Eight; and when I say One! you will fire. . . ." Ready . . . Ten, Nine, Eight, Seven, Six, Five, Four, Three, Two, ONE!"

* * * *

The fall had begun.

Twenty-six

"THEY WILL COME BACK"

A. On December the 11th the American ship *Salem* was measuring the depth of the sea in the Pacific Ocean—off the coast of America. It was about two hundred miles from the coast.

A man gave a shout. "We've touched the bottom now, sir," said the young officer named Field. "That is the last measurement needed. May we stop for the day, Captain?"

"Yes. That is enough for to-day," answered the Captain. "We will go back to San Francisco to-night."

As the Captain and his officers sat over their evening meal, they talked about the Great Gun and the three men who had been fired by it to the moon.

"Ten days," said the Captain. "They have been gone about ten days. What has happened to them? Is the shell still travelling round and round the moon—or what?"

"They will come back," said Field.

"That," said the Captain, "is just foolish talk. They *cannot* come back. How can it be possible? What I want to know is will they go round and round the moon for ever? Will they be seen again as they go round? Or have they gone past the moon out into space where they will never be seen again?"

"I say that they will come back," answered Field. "They will come back."

"Well," said the Captain, "our work here is finished. We can start back to San Francisco to-night. Go up and see that everything is ready, Field."

B. Field went up above. He looked up at the moon. "They will come back," he said; and, as he said it, he heard a strange sound. At first he thought that it was some sound from his own ship: but it became louder—and louder—so loud that the whole world seemed filled with the noise. The Captain and another officer came up to see what it was. They saw falling upon them from the sky a bright shining mass. It grew larger and larger. Then it fell into the sea, throwing up a great mass of water behind it high into the sky.

"It is as I said, sir. They have come back," said Field.

A *Radio* was sent to the War Office in Washington reporting what had happened and asking for orders. While waiting for the answer, the Captain marked the exact place where the thing had fallen.

"That is all we can do. We can't pull it up—whatever it is. We have nothing strong enough to do it. We must wait here."

Twenty-seven

"THEY HAVE COME BACK!"

Within a few minutes the news had spread all over the world. Some said that the "thing" was only a meteor which had fallen into the sea and a foolish young officer thought that it was the shell. Others told wild stories that the face of Michel Ardan had been seen at the window.

Only two people in the world could tell whether it might be the shell, or whether that was quite impossible: they were J. T. Maston and Dr. Belfast, watching day by day and night by night at the great telescope.

Maston was on watch on the afternoon when the shell came round the southern edge of the moon. He called out to Dr. Belfast who came hurrying from his bed where he slept beside the great telescope.

"I think I saw something," said Maston. "Come here quickly! Come and look!"

"I cannot see anything," said Dr. Belfast. "You only thought that you saw it."

Against the brightly lit moon it was not easy to see so small a moving point even with the great telescope. But later on, at about six o'clock in the evening, Maston cried out again: "There! Near Tycho! Look."

Dr. Belfast continued to watch in hopes of seeing it. But, as he watched, a great shadow came over

the moon: the colour of the moon seemed to become more red. The shadow deepened. He turned to Maston: "We shall see no more to-night. It is an eclipse of the moon by the Earth. Let us go to bed."

* * * *

Dr. Belfast was on watch. Maston was asleep. It was at about ten o'clock at night. A bell rang. Dr. Belfast answered it. "Dr. Belfast speaking: whom do you want? You want Maston. Maston! Here! You're wanted."

Maston got up. "Maston speaking. Who is it? . . Yes. WHAT DID YOU SAY! . . . Off the Pacific Coast! Have they marked the place? They have! Belfast! BELFAST! They have come back."

Twenty-eight

THE RESCUE

A. A great ship named *The Rescue*[1] was prepared in San Francisco: it was a ship built and used for just this one thing, for bringing up ships which had gone down in the sea; and, if it could bring up a big ship, it should be able to bring up the shell which weighed less than 19,250 pounds. The difficulty was the great depth. Very long metal ropes were put on to the ship, and some days were spent in getting everything ready. Every day Maston went to see how things were getting on; every day he cried out "Hurry! Hurry! Time is being wasted. When will it be ready?"

At last, after five days, *The Rescue* was ready to set out. J. T. Maston and Dr. Belfast went with it. Most of the people in San Francisco came to see the start.

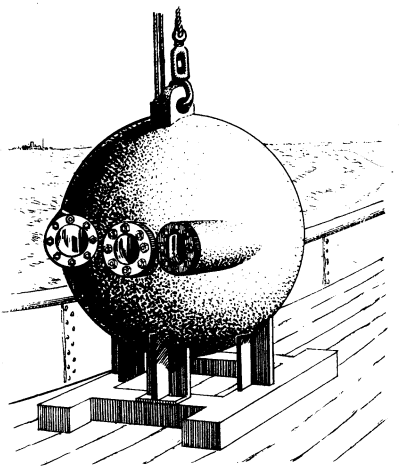
B. At eight in the morning *The Rescue* reached the place marked by the Captain of the *Salem.*

"When will you begin?" asked Maston of the Captain Fink.

"Now!" answered the Captain. "But the first thing to do is to make sure that it is there. The water is too deep for us to send a man down: even with the latest and best things no man can go

[1] To rescue a person from the sea means to save a person from the sea.

deeper than three hundred feet, and the shell—if it is there—is deeper than that. We must send down a *Bathysphere*: that means a Deep-ball; it is a round box of very strong steel with windows in the side and strong lamps sending light out into the water around. It has its own supply of air so it does not need an air pipe leading down to it. We move this ball over the bottom of the sea until we find the thing we are looking for; then we send down steel ropes: the man in the Bathysphere will tell us just how to move them so as to get the ropes under the shell. Then we will pull it up."



"That should not take long," said Maston. "We know exactly where the shell is. It may be a little difficult to get the ropes under it."

C. The great steel ball was let down over the side of the ship. There was a long wait as it went down towards the bottom.

"Hullo! Is all well?" said Captain Fink, speaking by telephone to the man in the steel ball.

"All well. Depth 360 feet: no bottom yet."

Another wait.

"Hullo, Captain Fink. I can see the bottom now. No sign of the shell. Move me slowly towards the north."

The Bathysphere was moved north. . . . It was moved to the south. . . . It was moved to the east. . . . It was moved to the west. . . . For six days the work went on. Nothing was seen. Nothing! Not a sign nor mark.

The Captain of the *Salem* and Field, his officer, were called and questioned again and again.

"You are sure that you saw it? . . . How big was it? . . . Where did it fall?"

Their story could not be shaken. The thing fell just on the place which they marked.

Yet there was no sign of it. It was not there!

They went on looking for the shell: a week had passed.

D. "For over twelve days my friends have been shut up in the shell at the bottom of the sea," cried Maston, "and we cannot find them! How long will their air supply last out? We MUST find them."

"The Pacific Ocean," said Captain Fink," is a very large place."

"But the shell is a small and very heavy thing," answered Maston. "It is not a piece of wood to be carried about by the water. It is impossible that it can have moved."

"It is not impossible," said Dr. Belfast. "A very strong flow of water might have carried it some distance."

For four more days the man in the Bathysphere

looked at the bottom of the sea, moving in wider and wider circles.

At last on the evening of December 24th Captain Fink gave the order to start back to San Francisco. "It is useless to try any more," he said. "If we hurry we can get back to land in time for the evening of Christmas Day.

E. In the early afternoon of December 25th there was a cry from one of the seamen. Captain Fink went to see what it was.

"Over there! To the east! Some silver thing with a flag on it."

"Why yes!" said the Captain. "I don't know what it is. It might be the upper part of a ship standing up out of the water. What do you think it is, Maston?"

The Rescue changed its course and went nearer.

"That is the American flag on it," said Captain Fink.

Dr. Belfast was now looking at the thing through a telescope. He threw the telescope down: "Fool!" he said. "Oh! fool!"

Maston looked at him.

"What does the shell weigh?" said Belfast in an angry voice.

"Less than twenty thousand pounds," said Maston.

"And what is its size? . . . If a thing that size were made of water, what would it weigh? It would weigh 56,000 pounds. Why have we been looking for the shell at the bottom of the sea? The shell is

less heavy than water. We should have been looking on the top. There! There is the shell!"

A boat was let down from *The Rescue.* The Captain, J. T. Maston and Dr. Belfast got into it.

The upper window of the shell was open as the boat came near, and the voices of the travellers could be heard singing. The voice of Michel Ardan rose strong and clear above the deeper sound of Captain Nicholl's and President Barbicane's voices.

"It seems to me," said Captain Fink, "that they are just finishing their Christmas dinner."

Twenty-nine

MEETING OF THE GUN CLUB

The great hall of the Gun Club was full. Members filled the doorways and even looked in at the windows. The noise of their voices was like the sound of the sea.

Then there was silence. Everyone stood up. There came a storm of *Hurrahs!* as Barbicane, Ardan and Nicholl came in.

President Barbicane hit the table again and again with the iron bar. The shouts went on.

At last, after half an hour, silence came again.

"Gentlemen," said President Barbicane. "I ask Major Elphinstone to read a Report on the work of the Gun Club during the past year."

The report was read. When it was finished President Barbicane stood up:

"We find that, after paying everything for the making of the gun, for the explosive, and all other costs, we have about seventy thousand dollars left. What is to be done with this money?"

There was silence. Then General Morgan stood up.

"I went to Tampa last month," he said, "and I visited Iron Mountain. The trees and grass are still black from the explosion, and the hole in the ground is a great danger to the public. It was at one time a

very nice place. People went out there on Sunday and had tea."

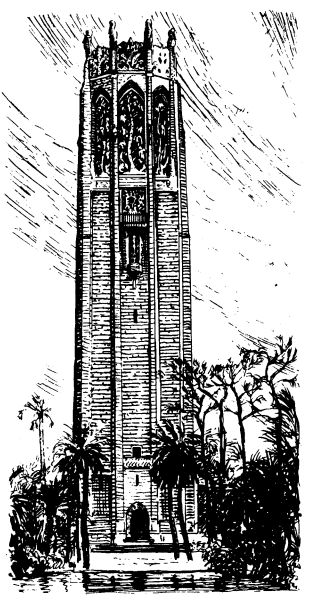
President Barbicane spoke:

"You mean, General Morgan, that this money might well be used to do something for the people of Tampa who were so very kind to us during our labours and who have suffered so much from them?"

"Yes."

"I think we might put up some building over the place where the great gun is—perhaps a nice building with a bell in it, sounding the hours, so that the people all around, when they hear the bell, will think kindly of us travellers to the moon."

* * * *



So this was done. Here is a picture of the Bell-house which stands to this day on Iron Mountain. It is really there; if you don't believe me you can go and see for yourself.

(Based on a photograph by kind permission of the Tampa News Bureau, and Burgert Bros., Tampa, Florida)

NOTE

Those who have read this book will of course ask how much of it is true. Is it really possible to travel to the moon? Are the facts about the moon true?

1. It would not be possible to shoot a shell to the moon, for many reasons. Even if the gun were made and were fired the shell would become so hot in passing through the air round the Earth that it would become liquid. A rocket does not travel so fast. For this reason (and many other reasons) if, and when, anyone tries to travel to the moon, he would use a rocket, not a gun. The sort of rocket which he might use is shown in the drawing on the next page. This drawing was made by a serious scientist: all the ideas have been carefully worked out, but the Main Drive (E on the drawing) is not, at present, possible, although scientifically it is reasonable.

2. No telescope could see a shell nine feet across at the distance of the moon.

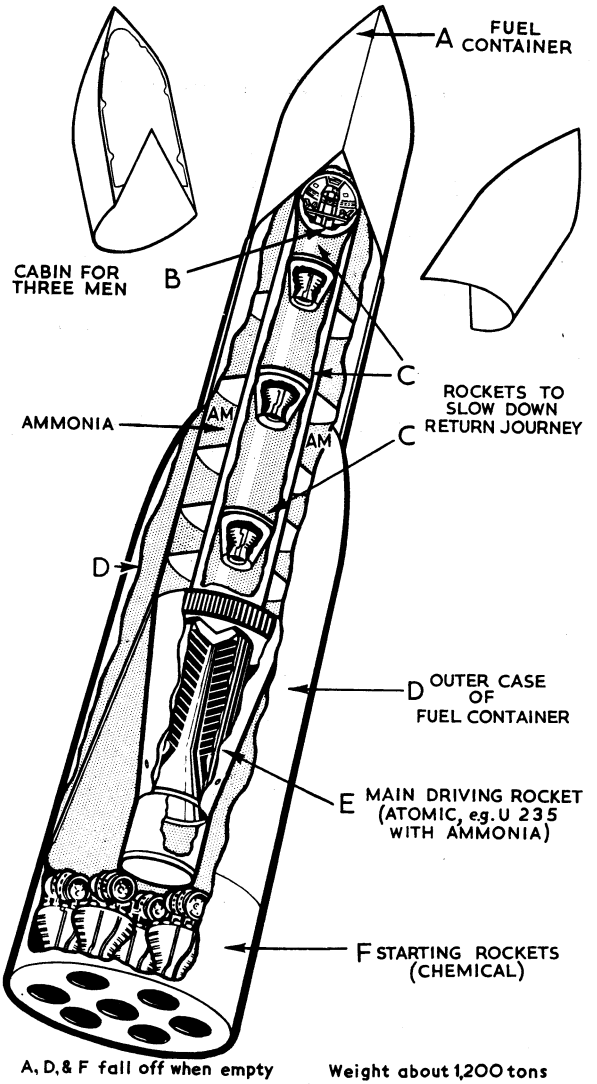
3. The "second moon of the Earth" (Chapter Seventeen, E) is not true.

The rest of the facts, about meteors and about the moon and the eclipse of the sun by the Earth, etc., are true. The map of the moon is drawn from a real map and the names on it are real names.

Ardan was a real person; he was a Frenchman named Nadar who made a balloon, and Jules Verne went up with him in it (but of course Nadar did not go to the moon).

The tower is a real tower; it was built by a newspaper owner named Bok.

Teacher: A full discussion of Verne's ideas will be found in *Rockets and Space Travel*, by W. Ley (Chapman & Hall): the drive of the rocket shown on page 118 is discussed in *Journal of the British Interplanetary Society*, Jan. 1949.


A FUEL CONTAINER
CABIN FOR THREE MEN
B
C
ROCKETS TO SLOW DOWN RETURN JOURNEY
AMMONIA
AM
AM
C
D
D OUTER CASE OF FUEL CONTAINER
E MAIN DRIVING ROCKET (ATOMIC, eg. U 235 WITH AMMONIA)
F STARTING ROCKETS (CHEMICAL)
A, D, & F fall off when empty
Weight about 1,200 tons

QUESTIONS

1. A 1. What is a club?
   2. In what country is the Gun Club?
   3. Who were the members of the Gun Club?
   4. How many members were sitting in the Gun Club?
   5. What had ended?

   B 1. Why had Bilsby only one arm?
   2. What things were hanging on the walls like pictures?
   (*a*) What were the soldiers asking for?
   (*b*) What are the soldiers looking for now?

   C 1. Who was Maston?
   2. What will Hunter become?
   3. What will Bilsby become?
   4. What will Maston do?

   D 1. Who came in?
   2. When will the meeting be?
   3. Who was Barbicane?

2. A 1. To what were the lamps fixed?
   2. Of what were the table-legs made?
   3. What was on the right of the table?

   B 1. With what did President Barbicane deal during the war?
   2. How old was President Barbicane?
   3. In what way was President Barbicane different from the other members?

   C 1. How wide is the moon? About 200 miles? 2,000 miles? 20,000 miles?
   2. How wide is the Earth? 800 miles? 8,000 miles? 80,000 miles?
   3. How far distant is the moon? 250 miles? 2,500 miles? 250,000 miles?
   4. Does the moon move in a perfect circle round the Earth?

   D 1. How far is the moon at its nearest point? 250,000 miles? 220,000 miles? 2,200 miles?
   2. Through what will the shot be travelling after the first 200 miles?
   3. What will the shot begin to do after travelling $\frac{5}{6}$ of the distance?

3. A 1. What did Captain Nicholl make?
   2. Why did Barbicane's gun go unanswered?
   3. How fast must a shot be travelling to get free from the Earth?
   4. What is the name of the explosive?

B 1. Will the gun be made of steel?
2. Who was Dr. Belfast?
3. What is a telescope?
4. How wide will the shot be?

C 1. How long does Captain Nicholl expect the gun to be?
2. (*a*) Who jumped up? (*b*) What did he say about the length of the gun?
3. How long will the gun be?

D 1. Will the gun point at the moon?
2. What did Hunter do when he was not working?
3. Where will the gun point? "At the place where —— (*a*) —— when —— (*b*)——"

E 1. How long will the shot take to reach the moon?
2. What did Dr. Belfast do?
3. What sound was there in the hall?

F 1. What happens to a long straight bar held at one end and in the middle?
2. What did Dr. Belfast do?
3. (*a*) What did some of the members do?
(*b*) What did the other members do?

G 1. Where will the gun be?
2. Who stood up?
3. Who will give the money?
4. What did Dr. Belfast not understand? "How we can —— (*a*) —— if —— (*b*)——"

4. A 1. Who were the four men? "Two soldiers and —— (*a*) —— and —— (*b*)——"
2. What will Major Elphinstone deal with?
3. What is the difference between a shot and a shell?

B 1. Of what must the shell be made?
2. Of what metal are some cooking pots made?
3. Is this metal (2) hard or soft?
4. What is R.R.?
5. How much stronger than steel is R.R.?

C 1. Who are promising money?
2. Where had the plan been reported?
3. (*a*) What did some people say?
(*b*) What did other people say?

5. A 1. What had been fixed to the wall?
2. What question had not been decided?
3. In what country will the gun be put?

B 1. Captain Nicholl said that the gun should be put —— where?
2. What way of carrying goods costs least money?
3. To which place is the sea journey shorter?

C 1. Of what must you think when you make a deep hole?
2. Of what has Dr. Belfast made a map?
3. Where does Dr. Belfast want the gun to be put?
4. How high is the mountain?

D 1. What was Dr. Belfast doing?
2. Where is the Iron Mountain which is made of iron?
3. Of what is the Florida Iron Mountain made?
4. What have the people at Chicago University offered to do?

6. A 1. When did the four men arrive at New Orleans?
2. What did Harrison carry?
3. What will Murchison do?

B 1. What is a furnace?
2. Where must the furnaces be built?
3. Where will the store-house be?
4. What was built from the sea to the mountain?

C 1. When did the work begin?
2. How many days have they for the work?
3. How often were the workers changed?
4. How deep was the hole after the first month?

D 1. What caused trouble in February?
2. How deep was the hole on May 10th?
3. What will be taken out from the hole?
4. How many furnaces were there?
5. When will the metal be poured?

E 1. Who were put all round the mountain?
2. When will the gun be fired?
3. Why could nothing be seen to the north?
4. When did President Barbicane look at his watch?

7. A 1. What was happening after 15 days?
2. What did the ground do to feet?
3. What work did they do after August 15th?

B 1. Who nearly fell down the gun?
2. How did they go down into the gun?
3. How soon will the gun be fired?

8. A 1. Where was President Barbicane sitting?
2. Who was with President Barbicane?
3. What does Michel Ardan say he will do?
4. What did Dr. Belfast say about Michel Ardan?

B 1. What would it be possible to make? A —— with an —— inside it.
2. What was Dr. Belfast doing?
3. When will the ship arrive?
4. When will the making of the shell begin?

9. A 1. What other name is given to Michel Ardan?
2. What did men believe about going high up a mountain?
3. What two things does Michel Ardan love?

B 1. Who have sent Michel Ardan?
2. What do these people (1) want to know?
3. How old was Michel Ardan?
4. What did Michel Ardan look like?
5. What colour was Michel Ardan's hair?

C 1. In how many parts is the shell to be made?
2. What is driven through small holes?
3. Why will not more explosive be needed? "Because the shell is ——"

D 1. What does not Dr. Belfast understand?
2. Which part of the shell will be nearer the moon when the shell falls?
3. What things at the bottom of the shell make it fall on the moon slowly?

E 1. What do the things marked xx do?
(*a*) Take out of the air the ——
(*b*) Add —— to the air.
2. What does the round mark show?
3. How many windows are there?

F 1. What will Maston do to bring them back from the moon?
2. There is no —— on the moon. No —— what?
3. Where might air be found?

10. A 1. Where did Captain Nicholl stand?
2. What things were behind President Barbicane?
3. What had been made on the black-board?

B 1. What question was asked? —"How —— ?"
2. Who answered this question?
3. Who is going with Michel Ardan in the shell?

C 1. Captain Nicholl says that President Barbicane is sure that there is no —— what?
2. What question does Michel Ardan ask of Captain Nicholl?
3. "Why don't you come with us?" What does Captain Nicholl answer?
4. When will Captain Nicholl get a good laugh?

11. A 1. Who arranged the making of the shell?
2. What animal was put in the trial shell?
3. Where did the shell come down? On the ——

B 1. Why could not Maston go in the shell?
2. Where will Maston stay for a week?
3. What was made to carry the shell?
4. How many days was the shell on its journey?

C 1. How was the Atomite carried to Tampa?
2. How far must all people be from the Atomite?
3. Why did men wait at the bottom of the gun?

D 1. Who waited in the hut?
2. For how long did the train seem to stop?
3. What did the workmen do?

12. A 1. At what time must the gun be fired?
2. What was not so red?
3. What was redder?
4. What was by President Barbicane's side?
5. What will the dog show?

B 1. On what was the shell?
2. Was the shell lying down or standing up?
3. What did Ardan cry?
4. What did President Barbicane say to Maston?

13. 1. Where was a man standing?
2. What would be blown to pieces if the shell fell? (*a*) —— and (*b*) ——
3. What was seen coming up out of the hole?

14. A 1. How far did Maston go?
2. What had been built over the hole?
3. With what was the roof covered?
4. What two things were on the table?

B 1. What was the time?
2. What must Maston press?
3. Why were the trees green?
4. How long must they wait if the ball was not pressed now?

C 1. How was Maston lying?
2. What was on his hand?
3. Where was the clock?
4. What one thing did Maston see on his left?
5. Why could Maston see nothing else?

15. A 1. What did walls do in Tampa?
2. Why did people shout at each other?
3. What happened when the smoke cleared?
4. Why was the telescope useless?

B 1. Who went to Mount Locke?
2. What was there at Mount Locke?
3. Where had the shot passed?
4. What two things may happen?
(*a*) The moon may ——
(*b*) The shell may ——
5. What has the Gun Club done?
6. For how long was there air in the shell?

16. A 1. With what were the walls covered?
2. What was under the seats?
3. How many lights were there?
4. What was Michel Ardan doing?

B 1. What did President Barbicane tell them to do?
2. What must they put under their heads?
3. What did President Barbicane do when there was five minutes more?

17. A 1. Who opened his eyes?
2. What was the time?
3. Who looked very bad—Captain Nicholl or President Barbicane?

B 1. What did Michel Ardan do to Captain Nicholl?
2. What did Captain Nicholl think?
3. Where did Michel Ardan and Captain Nicholl put President Barbicane?

C 1. Where was there a cut on President Barbicane?
2. Why does Captain Nicholl think that the gun has not been fired?
3. What did President Barbicane say? "It is very ——"
4. By what is the heat caused?

D 1. For how long have they been moving?
2. What did they see outside the window?
3. What did Michel Ardan see "over there"?
4. What did Captain Nicholl and President Barbicane do?

E 1. In how many hours should they reach the moon?
2. What was the "large dark thing"?
3. What is a meteor?

F 1. When do meteors become bright?
2. What is the meaning of the word "friction"?
3. What is the meaning of the word "attraction"?
4. Some scientists say that the Earth has —— how many moons?

G 1. President Barbicane said "Let us look at ——"? What?
2. Where was the sun?
3. Why did they not hear the gun fired?
4. Was the dog well or ill?

18.

1. Was there much feeling of movement?
2. Was the dog better?
3. Of what did President Barbicane make a trial?
4. At what did Michel Ardan look?
5. What was Captain Nicholl doing?
6. What did they play?

19. A

1. What will not the dog do?
2. Captain Nicholl says that the shell will travel for —— how long?
3. President Barbicane tells Captain Nicholl to look at the stars so as to tell —— what?
4. Who will help Captain Nicholl?

B

1. What did President Barbicane say? "We must be ——"
2. What did Captain Nicholl say? "We are ——"
3. What mistake did Captain Nicholl make? "He took the weight of the —— with the part which ——"

20. A

1. Of what was Michel Ardan sure? "That there were ——"
2. What did Michel Ardan do in the morning?
3. On whom did Michel Ardan fall?

B

1. Why did President Barbicane give a cry?
2. Michel Ardan said "I do not see how we can ——"
3. What must they do to the dog?

C

1. Captain Nicholl said that, if they opened both windows they would die of —— what?
2. What stores up heat on the Earth?
3. President Barbicane says that if they open both windows —— what will happen?

D

1. How much oxygen is there in the air?
2. What is the meaning of the word "pressure"?
3. What would happen if there were no pressure of air?
4. What did Captain Nicholl tell Michel Ardan to do?

E

1. What did the cup do?
2. What has Michel Arden lost?
3. President Barbicane took a cup from the table: what did it do?
4. How far are they from the Earth?

F

1. By what are their troubles caused?
2. How many times larger is the Earth than the moon?
3. How high will they be able to jump on the moon?
4. How much weight have they at this time?
5. Why have they so little weight? "Because the —— (*a*) —— and the —— (*b*) —— are equal."

G

1. Where is the shell pointing?
2. What is the shell doing?
3. What had Michel Ardan seen? "Another ——"
4. On what should they look down?

H 1. What has come back?
2. What passed the window?
3. What did Michel Ardan expect the dog to do?
4. What is the dog doing?
5. "You may think of the dog as ——" As what?
6. What has not the shell done?

21. A 1. When should the shell fall on to the moon?
2. At what did President Barbicane look?
3. What did President Barbicane fear? "That the shell might fall on ——"

B 1. What is the central part of the moon?
2. What should the shell have done?
3. Where should the shell be falling?
4. What does not Captain Nicholl care about?

C 1. What had the shell done at nine o'clock?
2. Michel Ardan asked, "Do you mean that we may ——?" Do what?
3. What might have been less than was expected?
4. How soon should they be down on the moon?

D 1. What would Captain Nicholl do if this were a ship?
2. What did President Barbicane do?
3. What did Michel Ardan do?
4. What is not the shell doing?
5. What is the shell's course?

E 1. (*a*) What is one force doing to the shell?
(*b*) Why will this force not become less?
2. What is the other force?
3. What will happen if the shell is following Curve 1?
4. What will happen if the shell is following Curve 2? "It will go——"

F 1. What did Captain Nicholl say? "A —— may ——"
2. "That is the answer!"—What is?
3. What had the meteor done to the shell?

22. A 1. To what part of the moon was the shell going? North or South?
2. Towards what plain was it going?
3. How high is Mount Copernicus?
4. With what is the moon covered?
5. How do you get such a ring on the Earth? "If you —— a stone into ——"

B 1. How far from the moon were they at one o'clock?
2. What might the colours be caused by? (*a*) —— or (*b*) ——
3. What was the name of the black mark?
4. What did the shell do at four o'clock?
5. To what side of the moon was it going?

C 1. What caused a light?
2. What did the meteor do?
3. What had man never seen before?
4. What will they be if a meteor strikes them?

23. A 1. What did Captain Nicholl see?
2. What caused this (1)?
3. What is Curve 3? "It is a —— curve."

B 1. Where is the shell at one point? Almost ——
2. What could not the donkey do?
3. Where was the shell passing?
4. What can be seen on the top of the Leibnitz Mountains?
5. What is Newton?

C 1. What is the name of the most beautiful mountain-ring on the moon?
2. What is Tycho? "A deep —— among many ——"
3. As you go northwards on the moon what happens?
4. Are they getting nearer to the moon?—or going away?
5. How is the shell turning?

24. A 1. What has Michel Ardan noticed? "That the —— is ——"
2. What did they see through the top of the shell?
3. What colour was the sky?
4. What causes the blue sky on Earth?
5. Why is there no blue sky round the moon?

B 1. At midday on the moon where is the Earth?
2. What was passing across the moon?
3. What poured down upon the moon?
4. What sort of eclipse was it?
5. When do you see sunset colours on the moon?

25. A 1. What does President Barbicane think that they ought to do?
2. What will force the shell into the attraction of the Earth?

B 1. What is the question in Captain Nicholl's mind?
2. How much of the Earth is covered with water?
3. "What hope is there for us either way?"
   (*a*) What does Captain Nicholl answer?
   (*b*) What does President Barbicane say?

C 1. What did the book do?
2. What was the chair doing?
3. What woke up Ardan?
4. What was the time?
5. What had begun?

26. A 1. Where was the *Salem*?
2. What were the men in the *Salem* doing?
3. How long is it since the gun was fired?
4. What did Field say?
5. Where will the ship go to-night?
6. What did the Captain tell Field to do?

B 1. What did Field hear?
2. What did Field think at first?
3. What did he see falling?
4. What did Field say to the Captain?
5. Whom did they ask for orders?

27. 1. What were John Maston and Dr. Belfast doing?
2. Who saw the shell come round the south of the moon?
3. What happened while Dr. Belfast was watching?
4. Who answered the telephone?
5. What did John Maston shout to Dr. Belfast?

28. A 1. What does the word Rescue mean?
2. For what was the ship *Rescue* built?
3. What things were put into the ship?
4. After how many days did the ship set out?

B 1. What is the first thing to do?
2. How deep can a man go into the water?
3. What does the word Bathysphere mean?
4. What will the man in the Bathysphere tell the Captain?

C 1. What was seen from the Bathysphere?
2. Whom did Captain Fink question?
3. For how long did they look for the shell?

D 1. John Maston says that his friends have been at the bottom of the sea —— for how long?
2. For how many more days did they look for the shell?
3. On what day did the ship start back to San Francisco?
4. What can they do if they hurry? "Get back to land in time for ——"

E 1. What did the seaman see?
2. What did Dr. Belfast ask John Maston?
3. Where have they been looking for the shell?
4. Where is the shell?
5. What were the three men in the shell doing?

29. 1. Who read the report?
2. How much money is left?
3. What is a danger to the public at Tampa?
4. What building stands over the opening of the great gun?

NOTE

1. If you were going to the moon what would you use?
2. Are the facts about the moon true?
3. Would it be possible to make such a gun and to fire a shell from it to the moon?
4. Could a telescope see a thing nine feet across on the moon?
5. What would have happened to the shell?

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Stories from Shakespeare
The Last Days of Pompeii
Hereward the Wake
Sleeping Mountain

Titles in Stage 4

Lorna Doone
Quentin Durward
The Black Tulip
The Cat of Bubastes
The Cloister and the Hearth
The Deerslayer
Tom Brown's Schooldays
Jungle John
African Explorers
She
The Bishop's Candlesticks
The Ghost Train
Little Women
Dr. Thorne
The Hunchback of Notre-Dame
The Last of the Mohicans
The Money-lender and other stories
The 'African Queen'
Oliver Twist
The Call of the Wild
White Fang
Mr. Midshipman Hornblower

LONGMANS